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A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATES AND DIAGRAMS.

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Part V. with Plate V.

(*Continued from page* 870 *of Vol. XVII.*)

THE RUSSELL'S VIPER (*Vipera russellii*).

Nomenclature.—Scientific.—The generic name is from the latin *vivus* alive, and *pario* I bring forth. It was first used scientifically by Laurenti in his work published in 1768. Daboia, another generic name for a long time in use, and perhaps more familiar to many of an older generation, was introduced by Count De La Cépède in his work published in 1789.* The name "Le Daboie" was applied by him to a West African viper of uncertain identity marked somewhat similarly to Russell's viper, in that it had 3 series of large oval spots. "Daboie" was, I believe, the local vernacular name for this snake. Later, Gray in 1842 applied the same term, only latinised, to Russell's viper, which, it may be remarked, does not occur in Africa.

Specific.—This title commemorates the name and fame of **Dr. Patrick Russell**, a distinguished savant, and the pioneer of all snake research work in India, both in its zoological and toxicological aspects. He was born in Edinburgh in 1726, and came out to India in 1781. Four years later the Honourable the East India Company appointed him their naturalist. He is responsible for a monumental work on the Indian snakes with excellent coloured plates, in two volumes published in 1796 and 1801.

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* P. 255.

The association of his name with this common snake, renowned as much for the beauty of its colour and ornamentation as for the deadly character of its bite, is a fitting tribute to his classical work.*

English.—The usual name among the Anglo-Indians is Russell's viper, but Daboia is almost as frequently in use. It is also occasionally called the Chain viper.

Vernacular.—It would be a matter of surprise if so well known, and justly dreaded, a creature had not been christened in almost every vernacular. That mysterious creature the "Cobra monil" of the natives, whose indentity, it ever appreciated by them, has become obscured by the lapse of time, is probably this snake as suggested by Jerdon.† The name probably originated with the Portuguese, "monil" or "manilla" in their tongue signifying a necklace, and "cobra" or "copra" a snake.

In Ceylon it is universally known as "Tic polonga," which means, I am informed, "spotted snake." In Southern India it is known as "Mandalli" and "Kanardi virian." The former, Nicholson says, implies a ringed or decorated pattern. The latter, which I have heard used chiefly about Madras is from "Kanardi," glass, and the allusion, I think, is to the spots which suggest to the fanciful native mind the appearance of the small mirrors used by them in their tawdry decorations, and frequently seen attached to cloths used as curtains, etc.

On the Malabar Coast (Cannanore) "Mandali" and "Rutheram mandalli" are in use, the former being also applied to the sand snake (*Eryx conicus*), and the latter used to discriminate between these species. "Rutheram" meaning "bloody" emphasises one of the most obvious effects of its bite, *viz.*, bloody discharges.

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* It may be of interest to note here that an elder brother of his, Alexander, has also left a name in this country to be handed down to posterity. The beautiful little garden shrub, *ussellia juncea*, with its curious foliage like casuarina and its vermilion flowers, which arcely any Indian garden is without, is named in his honour.

† Journal, Asiatic Society, Bengal, Vol. XXII, p. 524.

In Mysore a Canarese Dictionary I referred to gives "Mandalatha bavu" as the local name. "Havu" means snake. Rice in his work on Mysore * gives the Canarese name for it as "Kolaku Mandala." On the Coromandel Coast about Vizagapatam Russell gives its local name as "Katuka rekula poda," which I am told is Telugu, an refers to blackish spots.

About Bombay and in the Konkan it is known as the "Ghanas." In Guzerat Mosse says it is called "Chitar," and Fenton in the Dantra District "Khad chitra." "Khad," according to the latter, signifies "grass" and "Chitar" or "Chitra" recalls to mind other native names for spotted creatures.†

In Sind I am told it is called "Koraile."

In Bengal it is known as "Bora," "Chandra bora," "Uloo bora," "Jessur," and "Siah chandra amaiter" according to Fayrer. "Bora" probably implies spotted.‡ "Chandra" = moon, and refers as usual to the spots. "Uloo" is the name for "grass." The Burmese call it "Mwé bwé," meaning ringworm snake, its marks suggesting a skin disease.

Dimensions.—The largest specimen I have measured was a stuffed one in Trichinopoly 5 feet 3 inches in length. Lieut.-Colonel Fenton recorded one in this Journal¶ 5 feet 4½ inches long, and Mr. Brook Fox§ two measuring 5 feet 6 inches each. This is the largest record known to me. Specimens exceeding 5 feet are exceptional.

Bodily configuration.—The girth is remarkable. I think this viper is of stouter build than any other Indian snake, and its capability of inflating itself under excitement, premonitory to its violent hiss, accentuates this peculiarity.

The head is flat, and broadens considerably posteriorly so a
a moderate neck appear unduly small. A pronounced ridg
rostralis) runs from the supercilium to the top of the snout.
is moderate in size, the iris golden, and the pupil vertical. The

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* Vol. I, p. 188.

† Blanford in his Fauna of British India, Mammalia, gives "Chita" and "Chit local native names for the hunting Leopard (*Cynælurus jubatus*). Again he mentions synonyms as "Chital" and "Chitra" for the spotted deer (*Cervus axis*) "Chita" is al applied to the Leopard (*Felis pardus*).

‡ I notice the spotted deer, according to Blanford, is called in Bengal "Boro khotiya".

¶ Vol. XVI, page 178.

§ Vol. VIII, page 565.

is remarkably large and open, larger than in any other Indian snake. The tail is relatively short, and unusually apparent, owing to the rapid decrease in girth which occurs about the region of the vent.

The whole snake is remarkably rough, owing to the pronounced ridges (keels) on its scales.

Colour.—The ground colour is brown of varying shades, most specimens being a sandy, or cocoatina tint. The markings vary much in detail and intensity as well as in hue. Sometimes they are so obscure as to attract little attention, and this is especially so just before desquamation. The sloughing process over however, the same snake may reveal a definition of adornment, and brilliancy of colour, which may renovate it as completely as a mess uniform transforms an officer when exchanged for his khaki. The head has a more or less distinct dark patch on each side behind, a dark streak sometimes picked out with white, pink, or buff, behind the eye, and a dark stripe from the eye to the lip. A conspicuous light line, sometimes white, buff, or pink, runs from above the gape, through the temporal region to the supercilium on to the ridge just referred to on the snout. These lines converge, and sometimes meet on the snout to form a V. The lips are white, whitish, or pink variegated with spots, specks, or streaks.

The dorsal adornment consists of a triple series of large ovate spots, forming a vertebral, and two costal necklaces or chains, hence the term "Chain viper." Davy remarks*: "In some specimens the marks are oval, and in some more pointed, and rather trapezoidal; in others surrounded by a white margin; in a fourth lightest in the middle." It is not infrequent to see some of these spots more or less confluent, in fact, it is rarely one sees a perfect rosary. The
ts are frequently interrupted at their lower margins, and
taper, reminding one of a balloon.†
ot may be of uniform colour throughout, but more often
a light central zone, similar to the ground colour, which
s into a deep Lincoln-green, purple, or black, around which
may be seen a narrow zone of buff or pure white, the latter

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* "An Account of the Interior of Ceylon," p. 85.

† Since writing this I have seen a specimen sent to this Society by Mr. Kinloch from Kotagiri (5,700 ft.) in the Nilghiris in which the three series of spots are completely confluent into bands. The sinuous outlines of these bands indicate the number of spots, which however are broadly blended, in the entire length of the snake. It is the only one I have seen so marked.

especially enhancing the beauty of the specimen, as may be judged from our plate. Mr. Millard tells me that about Bombay adult specimens do not have this white definition to the spots, and he is inclined to regard it as a distinct variety. I have satisfied myself that specimens are to be met with in most parts, including Bombay, with and without this white adornment. To begin with, I found in some hatchlings of the same brood born in this Society's Museum, and preserved in spirit, some individuals with and some without the white delineament. Davy, already quoted, remarks that white margins, to the spots may or may not be evident in Ceylon specimens. In a mother I referred to in a note in this Journal* from Saugor, the spots had no light margins, though the single embryo had spots picked out with pale buff. Again, a specimen figured by Russell† obtained from Bombay has no suspicion of a light outline to the spots.

The belly is white, whitish, or yellowish, with darkish semilunes distributed sparsely, and disposed at the margins of the ventrals, especially in the fore body.

Identification.—Consideration must be given to the following points, all of which must coexist:—

(1) Head covered above with small scales throughout, similar to those on the back.
(2) No aperture between the eye and the nostril.
(3) Subcaudals divided.
(4) No ridges on the ventrals.
(5) 3 rows of large dorsal spots.

It may seem unnecessary to many to insist on this method of identification. Many I know who consider themselves knowledgeable on snake matters, would take it as a reproach to their intelligence to suppose they cannot rely on colour and marks alone; however I have known mistakes occur, and very positive opinions expressed erroneously wit regard to this species. More than one officer in China was very positi that they had captured Russell's viper in their camp at Shanghai, p lishing letters with some heat in the local paper when their opinions repudiated. The specimen which I subsequently examined pi to be the common Chinese Viper (*Ancistrodon blomhoffii*). I have seen a young python (*molurus*) identified as a daboia, and failed to convince another positive gentleman of his mistake. The sandsnake *Eryx conicus* I have several times known taken for this viper, and, incredible as it may seem, the Burmese tree snake *Dipsadomorphus multimaculatus*. This latter is a very slender little snake which has two series of ocelli, or ovate spots costally, these latter misleading its captor. Many specimens of *Zamenis diadema* are marked somewhat like the Daboia.

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* Vol. XVI, p. 874.

† Ind. Serp., Vol. II, plate XXXII.

Habits, haunts.—It may be met with almost anywhere except, I believe, in dense jungle, but it prefers open country into which the sun can penetrate and shed its agreeable warmth. Here it lies by day amongst the vegetation, in lazy apathy, apparently oblivious to its surroundings, but never, however, relaxing a vigil, which has for its reward the capture of the incautious animal that chances to stray within reach. In the evening it bestirs itself, and roams abroad whilst darkness prevails.

Its movements are slow, and consistent with its corpulent habit. When disturbed it prefers usually to maintain its ground, and frequently will contest the right of way with heaving sides, and angry hiss. When it does retire, it does so in a leisurely manner befitting its dignity and figure.

Fayrer* remarks on the authority of his snakeman that it will take to water, and Haly† mentions one swimming in the middle of a backwater. These are exceptional instances. Tennent‡ says that it will climb trees, and I can confirm this as a rare event, having known one in a low hedge. Its ungainly proportions, however, do not favour scansorial achievements. It is no uncommon event to find it in close proximity to and even in habitations, and its partiality to a murine diet sufficiently explains such intrusions. I remember one captured in Rangoon beneath the steps of the Cantonment Magistrate's Court during the day, with crowds of natives all about. Bassett-Smith§ mentions is frequently coming into the precincts, and into the Naval Hospital Trincomalee, and Tennent¶ says the Judge's house at this same tion became so infested with this species, that the family had to quit.

isposition.—No observer can speak with greater authority than

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* Loc. cit., p 15.

† First report on the collection of snakes in the Colombo Museum, 1886, p. 18.

‡ Loc. cit., p. 305.

§ Jour., Bom. Nat. Hist. Soc., Vol. XI, p. 546.

¶ Loc. cit., p. 296.

Fayrer, and he says of the Daboia: "In confinement it is sluggish, and does not readily strike unless roused, and irritated, when it bites with great force, and determination. When disturbed it hisses fiercely, and when it strikes does so with much vigour." This is entirely my own experience. It is a creature slow to wrath, contenting itself under moderate provocation, with a loud sustained and warning hiss, reminding one of a leaking foot-ball bladder. It will not strike till considerably irritated, when it hurls itself at the offending object with determined malice. I have known one spring with such a powerful muscular effort that I believe it actually left the ground in its endeavour to strike me.

The hiss once heard is not easily forgotten; no other snake emits such a volume of sound, to the production of which two factors contribute. Firstly the size of the lung which is developed to a degree commensurate with the remarkable body girth, and secondly the large size of the nostril, for it is through this aperture that the sound is produced.

In Bangalore I experimented with a large adult belonging to a snakecatcher. Among his stock in trade he carried the familiar gourd pipe used by this fraternity. This was sealed up in places with cobbler's wax which I removed, rendered pliable by heat, and packed into the Daboia's nostrils. This done the snake was unhanded, and irritated. It was then noticed that the lung expanded with difficulty, and very imperfectly, and hissing was no long feasible.

A good example of its disinclination to bite is related by Blanford*; a friend of his once carrying one home under the belief that it was a python until undeceived by its biting, and killing one of his dogs. It made no attempt to bite or injure him, though apparently he did not take any precautions in his manner of handling it. Again Fayrer† says he always during his experiments had the greatest difficulty to get this snake to bite voluntarily. I can fully confirm this; frequently rats put in as food into its cage remain there alive and unmolested for days. In making these remarks, however, I think one must expect many exceptions to this attitude of indifference. Young specimens especially seem more on the alert, more easily alarmed, and are correspondingly more easily provoked to bite than many adults.

The bite is sometimes inflicted by a snap, the creature relaxing its hold at once. On the other hand it is not unusual for Russell's viper to bite, and maintain a tenacious grasp for many seconds. In the case of a gunner who succumbed to the bite of this snake at Thayetmyo (Burma) in 1862, Nicholson* mentions that it was with difficulty shaken off. Elliott† mentions a dog bitten by one, dragging the snake many yards before disengaging it, and one might quote many more similar experiences.

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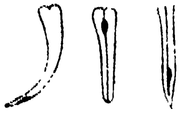
* Jourl., Asiat. Soc., Bengal, Vol. XXXIX, p. 874.

† Thanatoph. Ind., p. 64.

Poison apparatus.—*The fangs.*—These attain their maximum development in this the largest of the Indian vipers. There may be a single one in each maxilla, or two fixed side by side. In a depression at its base, and on the outer side, as many as 5 or 6 reserve fangs may be seen lying loosely in the mucous membrane, progressively diminishing in size from within outwards. When one of the fixed fangs is shed, the reserve fang best developed, and lying nearest to it, becomes cemented in a few days into the jaw.

The fang is tubular, being formed by the folding over of two lateral expansions of the tooth, which blend on its anterior face, in the major part of its length. A groove which is feebly discernible, but always present, marks the line of junction of these two expansions. At its base the expansions fail to meet, and the imperfect blending is marked by an aperture. The canal terminates near the point of the tooth in a minute opening.

The fangs in vipers are very mobile, or to speak more correctly, the maxillæ are, for the fangs are fixed into these bones. Russell's viper, like other vipers, when it yawns, frequently rocks its maxillæ forwards and backwards.



A. Inner aspect of fang (life size) the lower orifice of the canal is inclined slightly inwards.
B Anterior aspect (life size) showing seam where the two edges have been welded.
C. Tip (enlarged) showing lower orifice and point, closely resembling tip of hypodermic needle.

Glands.—These sacs compared with the cobra's are small, and present a corrugated appearance unlike the smooth retort-shaped glands of the cobra. Elliott‡ obtained 11 drops from the 2 glands of an adult. Wall¶

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* Ind. Snakes, p. 146.

† Trans Brit. Med. Association, S. Ind. br. 189, p. 7.

‡ Loc. cit., p. 88.

¶ Indian Snake Poisons, p. 118.

(A. J.) mentions a supplementary gland in this viper, globular in form, which completely surrounds, and empties itself into the ducts draining the major sac.

Poison.— Physical qualities.—Lamb* tells us that this venom is clear, with a small quantity of undissolved material in suspension. Its reaction is acid. The taste resembles gum acacia. In drying it cracks into longitudinal fissures yielding needle-shaped fragments. The dried product retains its toxic properties indefinitely, and is readily soluble in water.

Effects internally.—When swallowed, daboia venom has no more deleterious effect on the system than cobra poison, but of course one must postulate a healthy and unbroken surface in the mouth, and further passages. Elliott† gave 11 drops to a goat, and a larger quantity to a dog without noticing any ill effects.

Toxicity.—As every one in this country is doubtless fully aware, Russell's viper ranks among our deadliest snakes. The action of its poison is so different from that of cobra venom, that one can hardly compare their relative degrees of virulence. The poison appears to be as fatal in the doses usually injected during a bite, but death, except experimentally, is not so rapidly produced in large animals including man. Russell saw a fowl die in 36 seconds, Fayrer a fowl in 34 seconds, and Millard a rat die in 35 seconds. Lamb, however, has shown that these cases of precipitate death are attributable to relatively very large doses, and that in the case of large animals the dose necessary to produce such rapid death is larger than a Russell's viper could inject at one bite. A dog mentioned by Davy died 58 minutes after a bite in the leg. The dog Elliot saw succumb to a bite, died in less than 3 hours. Another dog which Traill saw bitten in four places died in 8 hours. The gunner referred to by Nicholson succumbed in 27 hours. In a case cited by Fayrer, an adult man died in 7 hours.

As in the case of other poisonous snakes it does not, however, in the least follow, that a serious bite will cause death if left untreated. There is abundant evidence to show that a percentage of cases, hard to determine, do not die even though the local injuries are such as to warrant the gravest apprehension. No more instructive record on this score is to be found in snake literature than that quoted by Elliot*. He says: "I myself saw a large powerful daboia (3 feet 8 in. long) "strike fairly at a dog, hold it, shake it, and only let go when the dog "had fled yelping several yards, dragging the snake along the ground. "The part bitten was soft, and fleshy, the bite was apparently a fair "one, the glands of the snake when dissected, though emptier than "usual, both proved to contain poison. From one gland alone I "obtained more poison than another daboia emitted through a "leaf in a vigorous bite. Add to all this that there was a well marked "subcutaneous extravasation round the bite, and the case seems perfect, " . . . . . though it became rather ill, did not die." "Eight "days later the same animal was fairly struck by a vicious daboia "(3 feet 4 in. long), the bite being almost instantaneous in its short- "ness, and this time the victim died in less than three hours."

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* Jour., Bom. Nat. Hist. Soc., Vol. XIV., p. 222.

† Loc. cit., p. 88.

Halyt† mentions a bite from this snake, from which the man suffered no ill effects.

In a recent number of this Journal‡ Colonel Bannerman expresses the belief that the young daboia is not provided with poison in its earliest days, or at any rate that the poison if secreted is too weak to kill even small creatures. This does not accord with my own observations, which convince me that they enter the world with a sufficiently abundant and active poison to thoroughly equip them in their struggle for existence. In confirmation of my own opinion I find that Dr. Shortt§ had a gravid daboia in captivity. On the production of its brood, a young one, measuring only 8½ inches when 6 hours old, killed a young partridge weighing 9½ tolas in 10 seconds! The failure of Colonel Bannerman's experiments must be attributed to the uncertainty of the effects of the bite already alluded to.

Further comments upon the poison of this snake are beyond the scope of this paper.

Food.—All my observations go to show that small mammals, and especially rats, constitute the main diet of the daboia but it is not so bigoted in gastronomic matters as to be disdainful of other fare. Mr. E. E. Green found one that had eaten a green lizard (*Calotes*

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* Loc. cit., pp. 7 and 86.

† First report on the Collection of Snakes in the Colombo Museum, 1886, p. 18.

‡ Vol XVII., p. 811.

§ Cyclopædia of India, Vol. V., p. 438.

ophiomachus) as well as a rat. Major Evans knew one in captivity eat two frogs, and a specimen in captivity in the Madras Museum* ate during its incarceration 5 squirrels besides 27 rats, whilst the young ate 67 mice, 5 squirrels, 4 frogs and 2 small rats.

In captivity as a rule they refuse food,† and it is surprising how they can keep health and vigour after months of deprivation from food and drink. Davy‡ had a specimen he kept for 146 days without food, and then allowed to bite a fowl which succumbed in a few seconds. Fayrer§ had one which lived for a whole year without food or water, and it was "vigorous and venomous to the last." I know of no snake-eating tendencies in adults, but cannibalism seems a common offence among the young. Major Dawson writes to me that on one occasion when young daboias were born in the gardens at Trevandrum, "the young commenced to devour each other," and on another occasion in the same place "one of the young swallowed one of its fellows, and in about a quarter of an hour disgorged it," and both at the time of writing were alive, and well. Father Dreckmann, too, told me of a similar experience among a brood born in captivity; he says "when I inspected the young family one morning, I found one of its members dead, and another one missing, and on examining the dead one I found the missing one inside him."

Breeding.—The literature on this snake affords more records of breeding than any other snake, I might almost say than all other Indian snakes taken together.

In spite of Colonel Bannerman's opinions expressed in a recent article in this Journal, and already referred to by me here, I think there can be no question that the daboia is viviparous in habit.

I am of opinion that the word "egg" as applied to the offspring and their envelope by this observer is misleading. The term "egg" is, it is true, a very indefinite one, which strictly speaking might be applied even to the human infant born in a caul. Its use, however, is restricted, at any rate in the popular mind, to the female cell impregnated or otherwise contained within a maternal envelope of chitinous, coriaceous, or cretaceous material. At a certain stage of embryonic development in viviparous snakes, eggs in the sense just referred to are to be found within the mother, invested with a leathery covering similar to that which is characteristic of the eggs in oviparous snakes. In viviparous snakes, however, the egg undergoes a metamorphosis never seen in the eggs of an ovipara. At a certain stage the leathery investment disappears, and the embryo as it approaches full term is found to be suspended in a limpid oily fluid, contained within a delicate, transparent sac, which I take to be the amnion, a fœtal not a maternal structure. At this stage it appears to me to be exactly comparable to the condition of a human infant born in caul.

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* Administration Report of Madras Govt. Mus., 1896-7.

† Mr. Spence, however, informs me that in his 7 years' experience in the Bombay Society's rooms this snake has fed better than any other species.

‡ Loc. cit., p 85.

§ Loc. cit., p. 15

Even supposing that a snake discharges fertile ova, it by no means follows that it is to be considered oviparous. Emotional and other causes are known to operate upon many gravid animals so as to cause in some cases the premature discharge of the fruits of generation, and it is no unreasonable assumption to suppose that similar causes may operate in the same direction in snakes. That they are susceptible to nervous influences is certain, or how otherwise can one explain the disagreeable habit so frequently evinced by captured snakes even when quite unscathed, of disgorging the contents of their stomachs, even when the rejectamenta are so far digested as to be unrecognisable.

Period of gestation.—From one of Colonel Bannerman's interesting domestic occurrences at Parel, it appears that the period from conception to discharge of the young exceeds six months.

Breeding season.—From this last statement it appears that these vipers are mating in the cold months. This receives confirmation by a note of mine dated Cannanore 28th December 1903 : a male specimen was brought me said to have been in copula; the female escaped capture. In cold climates this implies that they mate during the season of hibernation. This, if true, appears most remarkable for at this season a snake's vitalities are at their lowest ebb and not one would think favorable to the consummation of so important a function.

Fecundity.—It is a prolific snake producing sometimes more than 60 young at a time. Some mothers, however, are more modest in their imate of matrimonial duty, contenting themselves with a family of than 20. One recorded by me in this Journal contained but one solitary fœtus. I am inclined to think from observations on other snakes that the oldest mothers are the most fecund.

On two occasions at Trevandrum Major Dawson tells me that the mother died on the 3rd day after parturition, but this must be considered a coincidence. It is certain that the mother usually survives the advent of her brood, and one may presume lives to produce others.

Genital organs.—The ovaries are long, and the follicles loosely strung together. In one mother 4 feet 9 inches in length the ovaries were 6½ inches long.

The male genitals are peculiar. The clasper on each side is bifid, a character I believe to be found in all vipers. I have also observed the same condition in the sea-snakes, but not in any other colubrines. In a male 3 feet 7 inches in length, the main stem of each clasper was about half an inch long.

Hatchlings.—The young at birth vary from about 8½ to 11 inches. I very much suspect that the living embryos referred to by Stoliczka as 3 or 4 inches long* were not actually measured by him but their length guessed at.

The young usually rupture the sacs in which they are developed, before birth, that is, whilst still within the maternal abdomen. They then enter the world perfectly free. It is not unusual, however, for some or all of a brood to be born in cauls which they subsequently rupture. In a case alluded to by Mr. Phipson the hatchlings did not effect their escape till the day after deposition, a circumstance extremely remarkable, and to me inexplicable. Drowning would appear the inevitable consequence of any delay in such cases. According to Colonel Bannerman under these conditions the sac is split into 2 halves like a mussel shell. The young frequently cast their skins shortly after birth, often within a few hours. After birth they congregate, and lie together in a confused heap in captivity, but in nature very soon disperse. Their food is probably the same as adults. A young one I caught in Cannanore on a pot plant in a verandah, 10½ inches in length, had just swallowed a mouse.

I have collected 21 breeding notes from various sources which I append in tabular form.

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* See accompanying schedule of breeding events.

Date.	Locality.	Number.	Authority.	Remarks.	Reference.
April 1896	Trichinopoly	36	Self	Eggs in abdomina with no trace of embryo.	My notes.
May 1896	Do.	24	Do.	Do. do.	Do.
March 1902	Guzerat	55	Mosse	Do. do.	Bom. Journl., Vol. XV., p. 134.
June 1906	Bombay	9	Bannerman	4 born alive in membrane; young about 9 inches long. 5 non-fertile eggs.	„ „ „ XVII, p. 808.
July 1906	Wardha	15	Do.	7 born alive in membrane; fertility of rest not recorded.	„ „ „ „ „
September 1875	......	...	Miss Hopley	Young born in Regent's Park, London Some free, some in membrane.	" Snakes ", p. 436.
June 1903	......	14	Millard	3 young born alive and free; the rest dead hampered by membrane.	In Epistola.
June 1904	Howrah	25	Bannerman	Young deposited. Some ruptured membranes found on floor of cage.	Loc. cit.
July 1872	......	39	Shortt	Young born 8½ inches long; no further details.	Cyclopædia of India, Vol. V, p. 433.
......	......	40	Richards	Young born; no details...	Landmarks of Snake Poison Literature p. 21.

Date.	Locality.	Number.	Authority.	Remarks.	Reference.
......	......	9	Dreckmann ...	Young born ; no details...	In Epistola.
July 1904 ...	Burma ...	62	Evans ...	Do.	Do.
May 1899 ...	Trevandrum ...	18	Dawson ...	Do.	Do.
May 1905 ..	Do. ...	21	Do. ..	Do.	Do.
June 1902 ...	......	33	Millard ...	Young born ; 3 dead ; 10½ to 11 inches long.	Bom. Jourl., Vol. XIV, p. 614.
June 1899 ...	Indore ...	63	Cholmondeley ...	Young born, no details ; length 9 to 10 inches.	" " " XII, p. 765.
November 1904	Saugor ...	1	Self ..	Young in membranous sac in abdomina.	.. .. .. XVI, p. 374.
......	......	40	Anderson ...	Young in abdomina	Favrer, Thanatophidia of India, p. 14.
......	Umritsar ...	18	Stoliczka ...	Young 3 to 4 inches long ; alive in membranous sacs in abdomina.	Favrer, Loc. cit., p. 55.
July 1893 ...	......	40	Traill ...	Young in abdomina, fully developed ...	Bom. Jourl., Vol. VIII, p. 316.
......	......	...	Phipson ...	In Society's Museum ; in one case the embryos did not escape from membranes till the day after deposition.	" " " VI, p. 420.

Distribution.—Throughout the whole Indian Empire from Ceylon in the South to the Himalayas in the North. In the West it extends into Sind, and in the East to the furthest borders of Burma. Its distribution within these limits is, however, capricious. Irrespective of moderate altitudes it is extremely common in certain parts whilst it is extremely rare or absent in others.

In some parts of the Punjab it is very abundant. Fayrer tells us that at Umritsar in 1866 as many as 471 specimens were brought in for rewards in a single day.

Mr. Millard tells me it is very common about Bombay. I found it so on the same coast at Cannanore, and Ferguson still further south at Travancore. Haly and Ferguson say the same as regards Ceylon, and Tennent and Bassett-Smith especially mention Trincomalee in that Island. I found it abundant about Trichinopoly, and in the Central Provinces. Judging from the plethora of local names for it in Bengal mentioned by Fayrer, Ewart, Richards, and others it is probably common in parts of that Province. I am inclined to think, however, it is chiefly so in the Eastern parts of Bengal.

In Burma, Theobald remarks on its abundance in the Tharrawaddy district, and about Rangoon, and I can fully confirm this statement. In some parts of Upper Burma, notably Mahlaing, Magwe, and Myo-thit, it is so abundant in the crops that the natives make themselves special grass shoes as a protection.

It is by no means confined to the plains, occurring plentifully in many upland regions, and has been met with up to 7,000 feet. From Ceylon I obtained specimens from Hakgalla (5,700 feet). Ferguson says it is not uncommon in the hills of Travancore. Mr. Henderson tells me he met with it in the Nilgiris at 6,000 feet, and that it was fairly common in the Palneys at 7,000 feet. Father Gombert writes to me that it is common at certain seasons in the Palneys up to 6,300 feet. Stoliczka records it from Kashmir up to 6,000 feet.

On the other hand Nicholson says it is rare in Mysore, Richards in Bengal, referring, I think, to the Western Parts. In two years in the United Provinces (Fyzabad) out of many hundreds of specimens of snakes I never saw one daboia. Colonel Pratt and Mr. Oakes, both for many years familiar with these Provinces, had never seen or heard of it except at Sitapur. About Delhi I never saw or heard of one, though I have good authority for stating that it is very common about

Karnal. Murray says it is not common in Upper Sind, and Blanford makes a similar observation of South-Eastern Berar. Mr. Miller tells me that about Darjeeling he has only known one specimen in many years' residence, *viz*., from Kurseong (4,600 feet).

Description.—Head covered with small keeled scales similar to those on the back. *Rostral.*—As high or nearly as high as broad; in contact with 6 shields, of which the nasals make much the longest sutures. *Supraoculars* well developed, not divided. *Nasals.*—In contact with the rostral and the 1st supralabial. These are complicated in structure, consisting of a single shield pierced by a large unusually patent nostril. A vertical pillar-shaped portion demarcates this orifice anteriorly. This pillar bifurcates above to receive the anterior extremity of a crescentic scale. Two fissures demarcate the nostril, one above and the other below, but neither extend to the margin of the shield. *Supralabials* 10 to 12, the 4th largest; separated from the eye by 2 or 3 series of suboculur scales. *Sublinguals.*—One pair only, touching 4 or 5 infralabials. *Infralabials* 5. The 5th largest, and in contact with 2 scales behind. *Scales.*—Two heads lengths behind the head usually 25 or 27; midbody 29 to 31 (rarely 33); two heads lengths before vent usually 21 to 23. Keels present on all the head-scales, and all rows of body scales even to the tip of the tail. In the last costal row they are oblique and less pronounced than in other rows. *Ventrals.*—153 to 176, very broad, rounded, not ridged. *Anal* entire. *Subcaudals* 41 to 64, all divided.

Our plate is in every particular excellent, and is the work of Mr. Gerhardt.

(To be continued.)

THE 'SHOT-BORERS' OF BAMBOOS AND WOOD-BORERS OF *PINUS LONGIFOLIA.*

BY

E. P. STEBBING, L.R.S., F.R.S., F.Z.S., F.E.S.

In Volume XVII, p. 526 of our Journal, Mr. Norman F. T. Troup asked some questions relative to the attacks of bamboos by the 'shot-borer' beetles and the riddling of the wood of *Pinus longifolia* by the same or similar species of beetles.

Mr. Troup draws attention to the fact that the inhabitants of Kumaun hold that the bamboos and trees are only attacked by the borers if they have been felled during the period of the month when the nights are lit by the moon's radiance, and that, if fellings take place in that portion of the month during which the nights are dark, the bamboos and timber will remain unaffected.

That such an opinion is held by natives in many parts of India, as far as the immunity of bamboos is concerned, I am well aware. I have collected together the information extant on the subject and published a paper in the *Indian Forester* (Vol. XXXII, p. 534) entitled 'The effect of the moon's phases on the period of felling bamboos,' a copy of which I attach to this note.

The two common 'shot' borers of the bamboo are species of *Dinoderus*, *D. pilifrons* and *D. minutus*, both members of the family of beetles known as the *Bostrychidæ.*

Mr. Troup's remarks concerning the borers attacking the *Pinus longifolia* are of very considerable interest, as during a tour in Jaunsar and up the Tons Valley in the North-West Himalaya made in September-November of last year (1906), I carried out a series of preliminary investigations into the life histories of some of the *Pinus longifolia* bark and wood-borers. These beetles, for they are all coleoptera, are in no way related to the Bamboo *Dinoderus* beetles; they belong to a very different family, the *Scolytidæ*, a family which contains some of the most pernicious pests to trees known to science. The worst amongst them are two bark-boring beetles, *i.e.*, beetles which oviposit in the green bast layer or inner layer of the bark. These consist of a new species of *Tomicus*, which I have named *Tomicus longifolia,* and a species of *Polygraphus* as yet unnamed. The life histories of these insects I have partially worked out. It will not be necessary, however, to allude to them further here, since they do not come within the province of Mr. Troup's queries.

The wood-borers belong to that curious family of beetles known as the *Platypodæ*. These insects have been held by many scientists to be a sub-family of the *Scolytidæ*—more, I think I am right in saying, from a want of knowledge of the habits or of a real study of the species known than from any other reason. They differ from true *Scolytidæ* very considerably in appearance and form, as the most superficial examination will show. They in no way resemble the *Dinoderus* beetles, being more elongate and cylindrical with longish weak legs.

The fact that the *Platypodæ* are represented but by very few species in Europe is doubtless a reason for the ignorance that exists on the subject of their life histories.

India would appear to be rich in *Platypodæ*, and researches now being carried out will, I think, enable these curious insects to be placed in their proper position in the natural system. In *Departmental Notes on Insects that affect Forestry, No. 3*, I have detailed some notes on species tunnelling into *Quercus incana*, Deodar, Spruce, *Shorea talura* and *Heritiera littoralis*, ranging from the Himalayas to the Coimbatore Hills in Madras. Numerous other Indian species remain to be determined.

The beetle attacking the *Pinus longifolia* timber is, I speak subject to a further examination of the insect, a species of *Crossotarsus* (one of the *Platypodæ*) new to science. It infects newly felled trees and also standing sickly trees. The object of the attack is to enable the beetle to lay its eggs down in the heart wood of the tree. To do this the insect bores straight through the bark into the sap wood, carrying its tunnel for an inch or so into this latter before going off at an angle; from this point onwards the gallery may have several sharp zigzags in it. When completed, or nearly complete, a male and female beetle will be found in the tunnel, which is kept entirely free of wood dust, this latter being pushed up and ejected on the outer surface of the wood or bark. As many as 20-30 eggs are laid by the beetle and from them hatch out minute white dots, the size of pins' heads, which ultimately grow into small elongate larvæ with yellowish heads. They do not feed on the wood, but on a kind of fungus with which the tunnel bored by the beetles is lined: from this habit they have been given the name of "Ambrosia" feeders. The life cycle of this beetle is about 6 weeks from egg to beetle, in the case of the autumn generation. Eggs laid about the 1st to 2nd week of October hatch out within a couple of days or so, and the larvæ are full grown by the end of the month or 1st week in November. The pupal stage is about two weeks and the mature beetles issue about the 3rd week of the month should the weather prove favourable. I have not been able to work out the complete number of life cycles passed through in the year, but I am of opinion it will be found to be four or five. The first eggs of the year are laid about the middle of April, mature beetles from these issuing at the beginning of June; this is the first generation of the year. The beetles of the second generation appear somewhere about the middle of July, those of the third at the end of August, whilst a fourth lot appear to oviposit in the second week of October. Should the year be a favourable one—I mean by this should the autumn be a dry and warm one and the winter set in late—a fifth lot of beetles may develop towards the end of November and hibernate as such through the winter. Should the year be unfavourable, the insect probably hibernates for the winter in the larval stage at the bottom of the tunnels in the wood.

Such is the life history of this pest as far as it has at present been worked out. As I have said, it only attacks the wood when fresh. In no instance have I found the insect *alive* in dry timber. I gather from Mr. Troup's note that he is alluding to green as opposed to dry wood.

As to Mr. Troup's query as to why the insects only attack trees or timber which have been felled during the period of moonlight, I will reply with the question, is this true in the case of *P. longifolia*? The mere fact of my not having heard of this opinion in connexion with the long-leaved pine is not meant to throw a doubt on any statement of Mr. Troup's or any observations he may have made. In dealing with scientific questions one may be pardoned, I trust, for asking for the proofs. Mr. Troup will see in my paper on the subject in connexion with bamboos that I have suggested a series of experiments being made with the idea of settling once and for all the truth or otherwise of the native idea about this period of felling. If Mr. Troup would—should he be in a position to do so—commence a series of experiments with bamboos, ringals and *Pinus longifolia* and would let me have the results of his observations I should be under a deep obligation to him.

Now that the matter has been opened in the *Bombay Natural History Society's Journal* and in the *Indian Forester*, I trust it will not be allowed to drop until we have arrived at a definite opinion for or against what has been often termed a mere native superstition. Should the 'superstition' turn out to be based on actual facts, we shall be on more solid ground than at present in endeavouring to explain the reasons of this peculiarity and of turning it to practical account.

THE EFFECT OF THE MOON'S PHASES ON THE PERIOD OF FELLING BAMBOOS.

BY E. P. STEBBING.

(*From "The Indian Forester," Vol. XXXII, November, page 534.*)

It has been a matter of common knowledge for some decades past amongst those who have had any connexion with the cutting and export of bamboos in India, and to a certain extent of poles as well, that the natives have long held a superstition that neither the one nor the other should be felled when the moon is full; they argue that the sap is then very abundant, and unless the bamboos are well soaked in a tank and subsequently preserved with plenty of smoke they will be rapidly destroyed by boring insects (*cootee*) The most serious of these pests are the bostrichid beetles, *Dinoderus pilifrons* and *D. minutus*.* This curious theory is held so commonly throughout the country that I have been for some years past endeavouring to ascertain the causes which have given rise to it, the reasons upon which it is based, and whether any scientific facts can be adduced in its favour.

One of the explanations put forward is to the effect that the *cootee*, like many other wood-boring insects, prefers to lay its eggs in wood which has commenced to wither and which consequently no longer has a healthy flow of sap to interfere with the insect in its burrow This being so, the time immediately after the bamboo is cut down would be the most likely one for it to be attacked.

It seems to be a generally received idea that soaking bamboos, as also other timber, in water for a considerable time immediately after it has been felled, makes it less liable than it would otherwise be to suffer from boring beetles of all kinds. It is supposed that not only does the water prevent the beetles laying their eggs during the time the wood is immersed in it, but that it also drowns insects already at work, and dissolves much of the nutritive matter on which they otherwise feed.

That bamboos, once sickly and dying or dead, suffer largely from the attacks of beetles, must be obvious to the most superficial observer who glances over a bamboo clump, or examines furniture, houses, fences, etc., built entirely or partially of bamboos. We are not here concerned, however, with this aspect of the question; our purpose being to discuss the information at present available as to the effect the felling of bamboos and posts at different phases of the moon has upon their subsequent immunity or otherwise to the attacks of boring pests.

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* *Vide* my Notes on the Preservation of Bamboos from the attacks of the Bamboo Beetles or Shot-Borer. *Indian Forester*, App. Series (1903). *Ibid* XXXI, 249.

In their Forest Proceedings [*] the Madras Board suggested in 1898 that investigations should be carried out in this subject, and the experiments initiated as a result, although made in a few divisions in Madras only and in a manner which leaves room for improvement, are of very considerable interest as serving to show that the so-termed superstition of the natives of the country has perhaps some substratum of solid fact to rest upon.

Before detailing the various experiments made in this country I will first refer to a paper read by Ernest R. Woakes before the American Institute of Mining Engineers [†] in which the author stated that in South America (Columbia) *not only bamboos but all trees* are felled during the waning moon only and not during its increasing phases. It would appear that in that country the effect of the moon's phases is treated as an accepted fact. Mr. Woakes states from his own experience that he has often seen the sap running out of stumps during the increasing moon which were absolutely dry during the waning moon.

In a letter [‡] on the subject Mr. A. W. Peet, Acting Conservator of Forests, Central Circle, Madras Presidency, made the following remarks in 1899:—

'As regards bamboos I expect that the question of durability depends to a great extent on the question of sap, but the problem seems to be complicated by the doubt whether we are to reckon with the effect of the moon's phases, as well as with the period of the year at which they are felled. I doubt if even the borer can subsist without the elements of the sap on which to feed, and the principle of soaking bamboos is, I think, useful, chiefly because it tends to dissolve the fermenting constituents. Heating and smoking bamboos are additional precautions generally adopted.

'The point, however, which I wish to emphasise here is whether we should not primarily consider the period of the year at which bamboos are felled, and only secondarily the period of the month. There seem good grounds for paying attention to the latter, if we can only determine definitely the number of days in a month in which bamboos can be felled with confidence, and I will revert to this point. However, I think that, unless strong evidence is adduced to the contrary, we shall treat bamboos like other vegetation and assume that the period when the sap is most vigorous, and therefore the fear of fermentation most pronounced, is in the spring, and that this season should be avoided for felling if durability is of importance; and it may even be a question whether the root stocks will not be more injured during this period.

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[*] Board's Resolution. Forest, No. 255, dated 24th June 1898.

[†] This paper was reprinted in the *Tropical Agriculturist* for October 1899.

[‡] No. 454, dated Madras, 25th October 1899, to the Commissioners of Land Revenue, Madras.

'In order to test this presumption I lately questioned a bamboo contractor without giving him any leading question, and he told me that he believed that there was something in the waning moon theory, but that he had come to the clear conclusion that bamboos felled during March and up to the end of July had less durability than those felled during the other months of the year.

'As regards the phases of the moon, a hill man told me that he considered that bamboos might be felled safely during the seven days before new moon and the seven days after; but on being pressed as to what he considered absolutely as the best period he said during the seven days before. His theory of the seven days after would seem to conflict with Mr. Woakes' theory.'

The experiments carried out in Madras, although they cannot be considered to have been as definite as is desirable, are still of very considerable interest. They were initiated in four separate localities, *viz.*, the Nilgiris, North Coimbatore, South Coimbatore and South Malabar, and the following summarises the observations made.

NILGIRIS,
30th June 1899.

Bamboos were cut in all the ranges except Ootacamund a few days before and a few days after new moon and full moon and kept separate from each other. Some were smoked and others were soaked in water. It was found that bamboos cut on dark nights and immediately soaked or smoked for a period of two months were not attacked by the borers. From the experiments conducted in the various ranges it was observed that bamboos felled during moonlight nights were more severely attacked than those felled during dark ones. That soaked bamboos fared much better than unsoaked ones. As a result of the experiments the recommendation was made that as soon as felled, the bamboos should be fully immersed in water for some time or properly smoked in a shed, or otherwise they were liable to be attacked by the borers.

As I have shown, however, in my previous papers on the preservation of bamboos from the borers, neither immersion in water nor smoking are to be depended upon as safe preventives.

NORTH COIMBATORE,
24th August 1899.

A series of experiments were conducted in the Satyamangalam Depôt at the foot of the Ootacamund Hills. During each week of the month one head load of 25 bamboos of two kinds (dry solid bamboos known as 'Karanai' and green hollow bamboos known as 'Varar') were set aside and marked. It was observed that dry bamboos appeared to withstand the attacks of the borers better than the green. In every case the insects attacked the bamboos in the inside of the bundle first, *i.e.*, those not exposed to light. This is a general rule amongst these boring beetles who very generally, although by no means always, attack in the shade in preference to strong light.

As a result of the experiments conducted here it was held that the phases of the moon had no effect on the felling season. It was noted, however, that bamboos exposed to light and air are less liable to attack than those not so exposed.

SOUTH COIMBATORE,
18th February 1899 *and 1st November* 1899.

A series of experiments were made on two occasions at Mount Stuart, one from the 2nd August to 1st September 1898, and the 2nd from the 10th March to 12th April. On each occasion 10 large bamboos (*Bambusa arundinacea*) and 10 small (*Dendrocalamus strictus*) were cut daily. Each bundle of 10 was labelled and the bundles were all laid out in a row. Those cut on the first occasion were examined one by one on 2nd February 1899, with the result that the influence of the different phases of the moon did not appear to have any bearing upon the presence or absence of the borers. On the 2nd occasion one-half of the length of each bundle was covered with mats, the other being left uncovered. This was done in order to observe the effect of shade as a protective influence or otherwise to the bamboos. The bamboos so treated were examined at the beginning of October. It was found that the portions of the bamboos covered over by the mats had double the number of boring insects at work in them than were to be found in the uncovered portions. Thus the insects attack bamboos stacked in the shade twice as heavily as those stacked under the full rays of the sun.

The following were the percentages of attack observed in the case of the two species of bamboos experimented with :—

Bamboo.	Percentage attacked by borers on the first occasion.	Percentage attacked by borers on the second occasion.
Bambusa arundinacea...	50·58	34·33
Dendrocalamus strictus	39·47	41·66

It will be noted from the above that the percentage of attack in the case of *Bambusa arundinacea* varies considerably, being much higher in the case of the bamboos cut in August than in the case of those cut in March-April. In the case of *Dendrocalamus strictus*, however, the percentage of attack differs but little, the increase inclining to those cut in the spring months of the year. To be conclusive, further experiments with a larger number of bamboos should be carried out in this Division.

SOUTH MALABAR,
4th October 1899.

A series of experiments were made from 2nd August 1898 to 7th April 1899, both at the full moon and new moon periods. On each occasion a bundle of 25 bamboos was soaked in mud and water, while a second bundle was merely stacked. The experiments seemed to show that neither the soaking nor felling at any particular phase of the moon had any marked effect in preserving the bamboos from the attacks of the borers. It was noted, however, that the bamboos felled during the months of January, February and March were not attacked by the borers, stacked bamboos felled at other periods being invariably attacked.

The above summarises the experiments as far as they appear to have been carried in Madras. They support and confirm observations of my own on two points :—

(*a*) That the cold weather months are the best ones in which to fell, although felling at this season does not guarantee immunity to the bamboos from the attacks of the borers.

(*b*) That bamboos stacked in the shade, or covered up in such a manner as still to allow of the beetles getting at them, will be more severely attacked than those stacked in the open.

The question as to the best time in the month to fell requires a more detailed series of experiments to be carried out before we can finally say that the belief so commonly held in India is a mere superstition. It will be noted that in the Madras experiments the bamboos kept under observation were either *stacked together* or the bundles were placed in rows *adjacent to one another*. Now this procedure greatly detracted from the value of the experiments carried out, since it is possible, if not probable, that the bamboos cut at a certain period of the moon's phase first attracted the beetles which, appearing in numbers too great to find accommodation in the bamboos in the condition they preferred, overflowed on to and attacked neighbouring bundles which otherwise might have escaped. If the experiments are to be reliable, it is necessary to cut bamboos at different periods in the month from the same clump or forest and to stack the lots cut on different dates at considerable distances apart, so that the danger of the lot in the condition preferred by the beetles attracting the insects to the other will cease to exist.

A study of my note on the life-history of these insects will show that the beetles do not appear on the wing in December and January, at least in the more southern portion of the Continent, and for an even longer interval in the northern portions. This therefore accounts to some extent for the immunity of bamboos from attack at this period.

In order to settle the question of the effect of the phases of the moon on the period of felling, I would ask those interested in the subject to initiate a series of experiments as follows :—

(*a*) Bundles of bamboos to be cut weekly, each week's felling to be numbered and stacked *separately* as far apart as possible (at least a mile).

(*b*) The phase of the moon at the period of felling to be accurately noted.

(*c*) Particulars as to locality, elevation, etc., to be noted for each bundle cut.

(*d*) The bundles to be inspected *weekly* and rough notes as to the percentage of each bamboo attacked to be noted down for each week.

(*e*) The species of bamboo experimented with to be accurately noted.

(*f*) My own theory at present is that bamboos felled *during November and the first half of December* and *immediately piled* or *stacked in the sun* will not be attacked by the borers. I should like a verification of this by experiments carried out in different parts of the country.

It would lay me under a deep obligation if all who institute such experiments would forward me* a copy of their notes and observations, together with the deductions they draw therefrom.

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* To Dehra Dun, United Provinces.

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA." SERIES III, PART IX.

By

SIR GEORGE HAMPSON, BART., F.Z.S., F.E.S.

(*Continued from page* 677 *of Vol. XVII.*)

(*With a Plate.*)

URANIADÆ.

3045. *a.* EPIPLEMA POLEI, n. sp. (Plate E., f. 1).

White, frons brownish above, thorax slightly irrorated with brown; abdomen dorsally tinged with brown. Forewing faintly tinged with brown and sparsely striated with dark brown, some blackish points on costa; a strong medial blackish line very oblique from costa to lower angle of cell, then inwardly oblique, often interrupted in places and with brown suffusion beyond the cell and on inner area between it and the postmedial line which is slightly excurved below costa and incurved at middle and below vein 3, interrupted in places; two subterminal black points below apex and a dark brown line from vein 6 to termen at vein 3 with more or less brown suffusion on each side of it; a more or less developed diffused brown mark at tornus. Hindwing sparsely striated with dark brown, the inner margin with more prominent striæ; some fuscous irroration between lower angle of cell and termen; antemedial line extremely oblique from costa to lower angle of cell where it is acutely angled, then sinuous to inner margin; a black discoidal point; postmedial line oblique from costa to median nervules where it is excurved, then slightly sinuous to inner margin, some dark suffusion before it at costa and a diffused spot at apex; a brown line just before termen between the tails at veins 7 and 4 to which it is bent outwards; a brown spot on termen below the lower tail.

Habitat.—HONG KONG (J. J. Walker); CEYLON, N. C. Province, Puttalam (Pole). *Exp.* ♂ 20, ♀ 24 mill. Type in B. M. Named after Mr. J. Pole who has done so much in working up the Moths of Ceylon.

3053. *a.* EPIPLEMA SUBFLAVIDA, Swinh., A. M. N. H. (7), xvii, p. 553 (1906) (Plate E., f. 2).

♂. Head and thorax grey brown; palpi and frons black; abdomen greyish fuscous; pectus, legs and ventral surface of abdomen ochreous. Forewing grey-brown with indistinct dark striæ; an antemedial rufous spot in cell and blackish point below it; a curved rufous postmedial line from costa to vein 4 and a conical fuscous patch on inner margin with black on its outer edge; a fine black subterminal line slightly excurved from vein 7 to 5 then oblique to near termen at vein 3 and with some rufous on its outer edge; some fuscous suffusion near tornus; cilia pale at tips. Hindwing grey-brown with black striæ on costa and inner half; a subbasal brown line from cell to inner margin; a v-shaped rufous mark at end of cell; postmedial line dark brown defined by whitish on outer side and with a red-brown band on its inner side from vein 3 to inner margin, strongly excurved at middle and with some leaden suffusion beyond it followed by a rufous line obliquely incurved from vein 6 to inner side of the subterminal black line which is irregularly sinuous from the upper tail to termen at vein 2, intersected by an ochreous streak at vein 5 and with streaks beyond it on veins 4·3 ; cilia rufous ; underside yellow-buff with some dark striæ towards apex.

♀ More rufous and less suffused with leaden grey.

Habitat.—JAPAN ; N. KANARA, Karwar ; CEYLON, Kandy ; SINGAPORE ; PULO LAUT ; JAVA. *Exp.* ♂ 24, ♀ 28 mill.

3059. *a.* EPIPLEMA ENTHEARIA, Swinh., A. M. N. H. (7), xvii, p 283 (1906). Head and thorax white ; palpi brownish at base and black at tips ; antennæ brownish, the shaft with black points above ; vertex of head with some brown ; forelegs marked with black ; abdomen white irrorated with brown. Forewing white, the costal area striated with brown and the rest of wing with a few brown striæ ; a more or less developed curved orange postmedial band from below costa to lower angle of cell towards which it expands, edged with fuscous and with a blackish spot on inner edge ; a slight orange spot below costa towards apex ; a subterminal diffused fuscous patch between vein 6 and submedian fold almost touching the lower part of postmedial band usually present. Hindwing white with large orange patch on terminal half between vein 5 and tornus, its middle clouded and striated with black, its inner edge waved, its upper edge emitting an oblique v-shaped mark towards costa and its outer angled marks to the tails at veins 6 and 4, the latter with a black point below it ; the termen with some white between the tails and towards tornus.

Habitat.—SIKHIM ; BHUTAN ; ASSAM, Khasis. *Exp.* 20 mill.

3064. *a.* DIRADES NUBILA, n. sp. (Plate E., f. 3.)

♂. Pale reddish brown ; head blackish with white band between antennæ. Forewing sparsely irrorated and striated with black ; some fuscous suffusion on medial area from cell to inner margin ; an indistinct postmedial line excurved from costa to vein 4, then incurved ; some minute black subterminal points from apex to vein 4 ; termen tinged with fuscous. Hindwing darker red-brown especially towards termen, irrorated with a few black scales ; an indistinct curved postmedial line.

Habitat.—CEYLON, Uva 6,000′ (Alston). *Exp.* 34 mill. Type in B. M.

3067. *a.* DIRADES EROSIOIDES, Wlk., xxvii, 21 (1863).

Dirades kohistaria, Swinh., A. M. N. H. (7), vi, p. 307.

♂. Head blackish ; the base of shaft of antennæ and a band between them pure white ; thorax grey and fuscous ; abdomen yellowish, the dorsal area blackish at base, then suffused with fuscous. Forewing grey, thickly irrorated and striated with fuscous, the costal area suffused with fuscous ; a more or less indistinct oblique rufous striga from middle of inner margin ; postmedial line tinged with rufous especially on inner half where it is double, oblique from costa to vein 4 where it is excurved and has a small black spot on it, then incurved and ending at tornus; a series of small black points near termen; cilia rufous. Hindwing creamy yellow; the base blackish; some rufous in cell; the submedian interspace tinged with brownish, striated with black and crossed by traces of a postmedial line with rufous patch before it; the inner margin striated with black; the apex tinged with rufous; some black points on termen and a striga in submedian interspace.

♀. Hindwing grey thickly striated with black; a curved diffused brownish antemedial band; postmedial line double filled in with rufous and with some black suffusion before it, oblique from costa to vein 4 where it is angled outwards, then sinuous, the area beyond it suffused with black towards costa; a terminal series of small black and grey lunules between veins 7 and 1.

Habitat.— Ceylon, Maskeliya; Andamans, Port Blair; Borneo, Sarawak. *Exp.* ♂ 24-26, ♀ 24-30 mill.

3068*a*. Dirades funebris, n. sp.

♀. Head and thorax fuscous brown tinged with greyish; frons whitish; abdomen grey tinged with brown and irrorated with black. Forewing greyish suffused with brown and thickly irrorated with black to the postmedial line, the terminal area much paler and slightly irrorated with black; the 1st line medial, indistinct, diffused, black, oblique from costa to lower angle of cell, then inwardly oblique, postmedial line diffused, black, oblique from costa to vein 8, excurved to vein 4, then incurved; traces of a diffused subterminal line. Hindwing greyish suffused with brown and irrorated with fuscous; two indistinct diffused black antemedial lines from cell to inner margin; diffused curved black medial and postmedial narrow bands; the terminal area more strongly suffused with brown and with traces of a diffused subterminal band; a terminal series of slight black lunules; the underside brownish white slightly irrorated and striated with black.

Habitat.—Bombay. *Exp.* 28 mill. Type in B. M.

Geometridæ.

Boarmianæ.

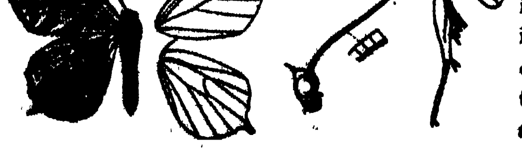
3082. Urapteryx ebuleata, subsp. *palniensis*, nov.

♂. Bright primrose yellow; fore and hindwings with the band fulvous; cilia bright fulvous; hindwing with scarlet centre to lower spot at base of tail.

Habitat.—Madras, Palni Hills 7000′ (Campbell). *Exp.* 58 mill.

Genus, Tristophis. *Type.*

Tristophis, Butl. Journ. Linn. Soc. Zool., xvii, p. 199 (1883)... ...... *veneris.*



Tristophis veneris ♂ 1/1.

Proboscis fully developed; palpi porrect not reaching beyond the frons which is smooth, rounded; antennæ of male laminate; head and thorax clothed with hair and without crests; hind tibiæ with two pairs of spurs, in male dilated with fold and tuft of hair; abdomen without crests. Forewing triangular, the apex rounded, the termen evenly curved; vein 3 from close to angle of cell; 5 from middle of discocellulars; 6 from upper angle 7·8·9 stalked; 10·11 stalked anastomosing slightly with 12. Hindwing with the termen slightly waved and produced to a short tail at vein 4; vein 3 from close to angle of cell; 5 absent; 6·7 shortly stalked; 8 approximated to the cell to middle.

3091. *a.* TRISTOPHIS VENERIS, Butl. A. M. N. H. (5), 1, p. 392 (1878); id. Ill. Het. B. M. iii, p. 29, pl. 48, f. 1.

White; antennæ fuscous; fore and mid legs tinged with fuscous. Forewing with the costal edge fuscous at base; a very oblique, slightly incurved brown band from costa before middle to middle of inner margin; an oblique brown discoidal bar; a brown postmedial band, somewhat incurved oblique and expanding below vein 4; an oblique subterminal band narrowing to inner margin; a fine brown terminal line; cilia orange at base, with brown medial line and whitish tips. Hindwing with brown discoidal point; a postmedial series of small brown spots, obliquely curved from costa to vein 4, then incurved and forming a band; a subterminal lunulate orange band, brownish at costa and towards tornus, expanding to near termen at middle, with black subterminal lunules on it above and below vein 4 and slight striga above vein 6; cilia orange, whitish at tips; the underside with the discoidal and postmedial spots larger, the subterminal band brown except at middle.

Habitat.—JAPAN; ASSAM, Jaintia Hills. *Exp.* 40 mill.

3154. *a.* HYPOCHROSIS HYPOLEUCA, n. sp. (Plate E., f. 4).

Forewing with vein 10 from 11 anatomising with 8·9.

♂. Head brown; thorax bright green; pectus and legs whitish tinged with brown; abdomen green, the penultimate segment with white terminal line, the terminal segment with black line, anal tuft and ventral surface ochreous white. Forewing yellow-green sparsely irrorated with black points and striæ, the costal edge fuscous brown; an elliptical black postmedial spot between veins 2 and 1. Hindwing yellow-green sparsely irrorated with black points and striæ, the inner margin narrowly white to beyond middle where there is a black striga from the margin. Underside of both wings greenish white with slight dark striæ.

Habitat.—MADRAS, Palni Hills (Campbell). *Exp.* 36 mill. Type in B.M.

3178. *b.* HETEROLOCHA LUNILINEA, n. sp.

♀. Head and thorax yellow; palpi rufous; frons tinged with rufous; legs rufous; abdomen yellow. Forewing greenish yellow faintly striated with brown and with minute brown streaks on costa; a maculate antemedial red-brown band, bent outwards below costa, then oblique; an oblique bar-shaped discoidal spot; an oblique maculate red-brown band interrupted in places from just below apex to inner margin beyond middle; cilia pale rufous. Hindwing pale ochreous sparsely irrorated with small brown spots and striæ; a purple-brown maculate band from costa just before apex to inner margin beyond middle; cilia pale rufous; the underside bright yellow irrorated with red-brown points, the postmedial band more prominent, a small discoidal spot.

Habitat.—SIKHIM TIBET, Yatung (Hobson). *Exp.* 40 mill. Type in B. M.

3183. *b*. LOXASPILATES ATRISQUAMATA, n. sp.

♀. Head and thorax yellow; palpi except at tips and sides of frons black; tegulæ with dorsal black patch, outer edge of patagia black; meso and metathorax with paired black spots; legs tinged with brown; abdomen yellowish white irrorated with black. Forewing yellow thickly irrorated with small black spots; small antemedial black spots on costa, median nervure and vein 1; a discoidal spot; an oblique postmedial series of small dentate black spots somewhat incurved below costa and excurved at middle; a diffused whitish subterminal band with series of dentate black spots on its outer edge, incurved between veins 6 and 4; a terminal series of small black spots. Hind wing yellowish white irrorated with fuscous; a terminal series of black points; the underside more prominently irrorated with fuscous points, a small discoidal spot and traces of an oblique postmedial line.

Habitat.—SIKHIM TIBET, Yatong (Bingham Hobson). *Exp.* 38-44 mill. Type in B. M.

3226. *c*. ZAMARADA TENUIMARGO, Swinh., A. M. N. H. (7), xvii, p. 379 (1906).

♂. Head pale reddish brown; thorax and abdomen brownish white. Forewing semihyaline green; the costa red-brown with darker irroration; a narrow terminal red-brown band edged by a fine dark line on innerside, expanding somewhat from apex to vein 4 and at tornus; a black discoidal point. Hindwing semihyaline green; a black discoidal point; a narrow sinuous red-brown terminal band with fine dark line on its inner edge.

Habitat.—ASSAM, Khasis. *Exp.* 30 mill.

3271. *Hyposidra megaspila* insert H. CIRCUMFLEXARIA, Koll. Hügel's. Kashmir, iv, p. 485 (1842), which has precedence.

3278. *a*. HYPEPHYRA CYANOSTICTA, n. sp. (Plate E., f. 42).

♂. Head and thorax dark red-brown and black irrorated with silvery blue; basal joint of antennæ white above; abdomen whitish tinged with brown and with slight brown and silvery blue dorsal crests. Forewing with the basal area black-brown irrorated with silvery blue, its outer edge obliquely curved; the medial area ochreous white irrorated with silvery white and slightly striated with brown; a reddish discoidal spot; postmedial points on veins 4, 2 and 1; a blackish triangular patch on costa beyond middle irrorated with silvery blue; terminal area red-brown and blackish leaving the apex whitish and with a waved silvery subterminal line on it. Hindwing ochreous white thickly striated with brown and suffused with red-brown towards termen; a waved silvery subterminal line. Underside yellow striated with fuscous; forewing with discoidal spot, the terminal area fuscous with yellow patch at apex and spot below vein 4; hindwing with oblique maculate medial line and sinuous subterminal line dilated into a triangular patch on costa.

♀. Abdomen and pale areas of fore and hindwing suffused with purplish fuscous; forewing with the discoidal spot fulvous.

Habitat.—TRAVANCORE, Pirmád (R. S. Imray). *Exp.* 44 mill. Type in B. M.

3316. *a*. OROCALLIS FUSCILINEA, n. sp.

♂. Pale ochreous yellow; tibiæ and tarsi tinged with brown. Forewing sparsely irrorated and striated with brown; a fine fuscous antemedial line very slightly angled on median nervure, then oblique; a small spot at upper angle of cell; an oblique fuscous postmedial line, diffused on inner side and slightly incurved below vein 4; cilia with a faint rufous tinge from apex to the angle at vein 4. Hindwing sparsely irrorated and striated with brown; a slightly sinuous fuscous postmedial line diffused on inner side; the underside with the line minutely waved.

Habitat.—KASHMIR, Nubra (McArthur). *Exp.* 38 mill.

3332. HETEROMIZA CRUENTARIA, insert (syn) *Mimomiza flavescens*, Swinh., A. M. N. H. (7), xvii, p. 284 (1906), for the yellow form.

3332. *b*. HETEROMIZA OBLIQUARIA, Leech, A. M. N. H. (6), xix, p. 182 (1897).

Antennæ of male ciliated; mid tibiæ not dilated; forewing with veins 10·11 from cell, 11 anastomosing with 12.

Pale reddish brown suffused with grey and irrorated with fuscous; palpi and frons bright rufous; pectus, legs and ventral surface of abdomen fiery orange. Forewing striated with fuscous; antemedial line acutely angled outwards below costa, then very oblique; postmedial line strong, rufous, tinged with olive brown, very acutely angled outwards to below apex and met by an oblique streak from apex with some white above it, then very oblique: cilia dark rufous. Hindwing irrorated and striated with fuscous; a strong oblique medial olive brown line defined by greyish on outer side; an indistinct curved postmedial line; cilia dark rufous. Underside of forewing with slightly sinuous grey line beyond the postmedial line in one specimen, conjoined to it in another; hindwing with the postmedial line well developed.

The typical Chinese form is greyer; forewing with the antemedial line slight; hindwing with the postmedial line obsolete on upperside; underside of forewing with the grey line forming part of the postmedial line; hindwing with the postmedial line less curved.

Habitat.—W. CHINA, Chang Yang; ASSAM, Khásia. *Exp.* 46 mill.

3368. *a*. GNOPHUS SENICARIA, n. sp.

♀. Head, thorax and abdomen grey-white slightly tinged with brown and irrorated with fuscous; fore tibiæ and tarsi fuscous ringed with white; abdomen with double dorsal series of dark points and lateral and ventral series. Forewing grey-white tinged and irrorated with brown; an indistinct antemedial line with blackish spot at costa, oblique to median nervure, then incurved; a black discoidal spot; medial line with blackish spot at costa, angled outwards below costa, then oblique, sinuous; postmedial line blackish, angled inwards below costa and outwards at vein 6, then oblique, dentate, incurved in submedian interspace, some brownish suffusion beyond it between veins 5 and 3 ; an indistinct dentate subterminal line with blackish marks on and below costa, the area beyond it whiter from above vein 4 to below 3 ; a terminal series of small black spots ; cilia white at base, brownish at tips. Hindwing grey white tinged and irrorated with brown ; a rather diffused sinuous antemedial line ; postmedial line blackish, dentate, incurved below vein 3, and with brownish suffusion beyond it ; an indistinct subterminal line with somewhat dentate dark marks on it ; a terminal series of small black spots and fine waved black terminal line ; cilia white at base, brownish at tips. Underside white ; both wings with strong blackish medial line with small black discoidal spots on it, on hindwing oblique below vein 5 ; forewing with the terminal area blackish ; the apex paler and a white terminal patch from vein 4 to below 3 ; hindwing with waved postmedial line with blackish band beyond it, broad to vein 4, narrowing toward tornus

Habitat.—SIKHIM (Dudgeon). *Exp.* 42 mill. Type in B. M.

3369. *c.* GNOPHUS LEUCASTRARIA, n. sp.

♂. Head, thorax and abdomen fuscous mixed with grey and brown. Forewing grey thickly irrorated and striated with fuscous ; an indistinct diffused double blackish curved and waved antemedial line ; a round black discoidal spot with white centre ; an indistinct diffused double blackish dentate postmedial line, excurved to vein 4, then incurved ; subterminal line indistinct diffused double waved, incurved below vein 3 ; a terminal series of black points. Hindwing grey thickly irrorated with fuscous ; a small black discoidal spot with white centre ; an indistinct diffused double dentate postmedial line, excurved to vein 4, then incurved ; an indistinct diffused double waved subterminal line ; a terminal series of black points. Underside grey tinged with fuscous ; both wings with slight discoidal spot and indistinct diffused curved postmedial line.

Habitat.—BHUTAN (Dudgeon). *Exp.* 42 mill. Type in B. M.

3372. *b.* GNOPHUS CONFUSA, Warr. Nov. Zool., ix, p. 367 (1902).

Antennæ of female bipectinate with short branches.

♀. Head, thorax and abdomen grey brown irrorated with fuscous. Forewing brownish grey thickly striated with brown and irrorated with black ; an indistinct brown discoidal bar ; postmedial line represented by traces of dark striæ from costa and inner margin ; faint traces of a subterminal series of slight black points. Hindwing brownish grey thickly striated with brown and irrorated with fuscous ; traces of a diffused dark antemedial line and discoidal bar ; also of postmedial and subterminal band ; a terminal series of slight black points. Underside greyer ; both wings with fuscous discoidal lunule ; forewing with fuscous postmedial spot on costa.

Habitat.—CHITRAL. *Exp.* 56 mill.

p. 256. Under BOARMIA insert *Carecomotis*, Warr. Nov. Zool., iii, p. 492 (1896), type *perfumosa.*

3388. *a*. **BOARMIA XANTHOZONEA**, n. sp.

Head, thorax and abdomen violaceous grey irrorated with brown, the last with blackish segmental bands. Forewing violaceous grey irrorated with black-brown, some orange yellow before the antemedial line, just beyond the medial line from costa to median nervure and before it on inner area, and beyond postmedial line; antemedial line double, incurved below cell; an indistinct oblique sinuous medial line; postmedial line double, excurved from below costa to above vein 4, then oblique, waved; a waved whitish subterminal line defined by dark brown on inner side and with some red brown suffusion beyond it; a terminal series of small black spots. Hindwing grey-white irrorated with black brown, the costal area paler, a slight yellowish tinge at medial line on inner margin and beyond the postmedial line on inner area; a blackish subbasal bar on inner area; an oblique incurved medial line from discal fold to inner margin; a discoidal striga; postmedial line slight and oblique from costa to discal fold, then double and slightly sinuous; subterminal line waved, from discal fold to inner margin, defined by grey on outer side; a terminal series of small black spots and fine terminal line. Underside of forewing with oblique discoidal striga, rather diffused postmedial line excurved to vein 4 and diffused waved subterminal line; hindwing with small discoidal spot, postmedial line angled at discal fold, then slightly waved, a waved subterminal line.

Habitat.—SIKHIM TIBET, Yatong (Bingham, Hobson); SIKHIM (Möller) *Exp*. 30-40 mill. Type in B. M.

3397. *b*. **BOARMIA SEMIPARATA**, Wlk., xxiii., 764 (1861).
Acidalia illepidaria, Wlk., xxiii., 765.
Diphurodes vestita, Warr. Nov Zool., iii, p. 132 (1896).
Diphurodes indentata, Warr. Nov. Zool., iv., p. 193 (1897),
Myrioblephara pustulata, Warr. Nov. Zool., VII., 114 (1900).

Antennæ of male ciliated; hind tibiæ dilated; abdomen with lateral tufts of long hair from medial segments.

Pale reddish brown tinged with grey and irrorated with black; abdomen with the medial segments dorsally tinged with fuscous. Forewing with the medial area paler; an indistinct subbasal line from costa to submedian fold; antemedial line indistinct with more prominent black striga from costa and point on median nervure below which it is incurved; a black discoidal bar; medial line angled outwards beyond the cell, then oblique and with a black band between it and postmedial line from vein 4 to inner margin; postmedial line minutely waved, obtusely angled at discal fold, then incurved, angled outwards at vein 2, then again incurved, a diffused black fascia from it to termen in discal fold; subterminal line greyish, dentate, defined by blackish patches on its inner side; a terminal series of black points · cilia chequered grey and blackish. Hindwing with diffused antemedial blackish band with the black discoidal bar on its outer edges; a medial line angled outwards in discal fold, then incurved; subterminal line grey defined by brown on inner side dentate and angled inwards in discal fold ; a terminal series of black points. Underside fuscous with the pale areas whitish.

Habitat.—SIKHIM ; KHASIS ; CEYLON ; PENANG ; BORNEO. *Exp.* 28-32 mill.

B coremiaria, Hmpsn., is a distinct species.

3404. BOARMIA ACACIARIA del. *Boarmia cornaria, invectaria, properata, concursaria* and *contectaria.*

Sect. (*Carecomotis*). Antennæ of male bipectinate with long branches to two-thirds, the apex ciliated, of female with short branches ; hind tibiæ dilated ; forewing with fovea.

3404. *a.* BOARMIA CORNARIA, Guen. Phal., 1, p. 254 (1857).
Boarmia invectaria, Wlk., xxi, 375 (1860).
Boarmia properata, Wlk., xxi, 376 (1860).

♂. Head, thorax and abdomen brown mixed with grey and irrorated with fuscous ; abdomen with subdorsal series of black segmental bars. Forewing grey suffused with brown and striated with fuscous ; a blackish antemedial line slightly excurved from below costa to submedian fold, then oblique : an elliptical discoidal spot defined by fuscous, placed on a minutely waved medial line which is oblique below the cell ; postmedial line minutely waved, very oblique below discal fold ; an indistinct waved whitish subterminal line with slight fuscous streaks before it in the interspaces ; the terminal area with slight pale patch at middle ; a terminal series of small black lunules. Hindwing grey suffused with brown and irrorated with black, the basal half rather paler subbasal and medial slightly waved lines ; an elliptical discoidal spot defined by fuscous ; postmedial line minutely dentate, excurved ; subterminal line indistinct, waved, whitish, defined on inner side by slight fuscous marks ; a terminal series of small black lunules. Underside white, the lines fine, the black discoidal spots prominent ; forewing with large fuscous apical patch with whitish apical blotch and small fuscous patch on termen below middle ; hindwing with fuscous subterminal patch between veins 7 and 4.

♀. More suffused with fuscous ; abdomen with the first two segments dorsally blackish ; wings at costa [illegible] stronger ; forewing with the discoidal spot larger and connected with costa.

Habitat.—PUNJAB, Manpuri ; BOMBAY, Poona ; CEYLON, Trincomali ; BURMA, Thayetmyo. *Exp.* ♂ 34, ♀ 38 mill.

3404. *b.* BOARMIA DECISARIA, Wlk., xxxv, 1589 (1866).

Head, thorax and abdomen whitish mixed with fuscous ; antennæ fuscous ; abdomen with paired dorsal series of blackish points. Forewing whitish irrorated and minutely striated with fuscous, the medial area paler; an indistinct antemedial line arising from a blackish mark on costa, angled at submedian fold, then oblique ; two blackish marks on medial part of costa ; an elliptical black discoidal spot ; postmedial line minutely dentate, oblique below vein 4 and with an indistinct diffused brownish line beyond it ; an indistinct somewhat dentate brownish subterminal line with fuscous patches on it at costa and discal fold ; a terminal series of black points. Hindwing whitish, irrorated and minutely striated with fuscous; an indistinct oblique antemedial line; an elliptical black discoidal spot; a minutely dentate postmedial line, somewhat excurved at middle and with diffused brownish line beyond it; a diffused brownish subterminal line; a terminal series of small black spots. Underside of forewing with prominent blackish patch on costal area towards apex.

Habitat.—CEYLON, Kandy; JAVA. *Exp.* 42 mill.

3404. *c.* BOARMIA CONCURSARIA, Wlk., xxi, 377 (1860).

Boarmia contectaria, Wlk., xxvi, 1537 (1862).

Head and thorax whitish mixed with red-brown; palpi fuscous at tips; frons whitish below, blackish above; antennæ blackish; abdomen whitish tinged with red-brown and irrorated with fuscous. Forewing whitish suffused with red-brown and irrorated and striated with fuscous, the medial area whiter; antemedial line excurved below costa, very oblique and sinuous from cell to inner margin; an ill-defined elliptical greyish discoidal patch; a very oblique slightly sinuous line from lower angle of cell to inner margin; postmedial line with blackish point at costa, indistinct and angled inwards below costa, bent outward at veins 6·5, then black, very oblique and very slightly sinuous, an oblique brown shade beyond it arising from termen below apex; two faint diffused, slightly waved subterminal brown lines from the oblique shade to inner margin; a terminal series of fuscous points Hindwing whitish tinged with red-brown especially on terminal half and irrorated and striated with fuscous; an oblique brown antemedial line; an elliptical greyish discoidal spot defined by black; a blackish postmedial line, slightly angled at vein 6, then oblique and with a diffused brown line beyond it; two rather diffused minutely waved subterminal brown lines; a fine waved blackish terminal line. Underside white; forewing with round black discoidal spot, postmedial line angled at vein 5, then very oblique, a curved diffused band across apical area; hindwing with elliptical black discoidal spot, slight curved postmedial line and diffused subterminal line.

Habitat.—"N. India"; BOMBAY, Kanara; CEYLON, Trincomali. *Exp.* 38 mill.

~~3416. *b.*~~ BOARMIA HOLOPHÆARIA, n. sp.

♂. Head, thorax and abdomen fuscous brown with a greyish tinge; legs irrorated with fuscous, the tarsi with slight pale rings. Forewing fuscous brown with a greyish tinge and slight fuscous striation; a blackish antemedial line, rather diffused at costa, excurved below costa, then oblique and with slight black marks at the veins; a black discoidal bar; medial line diffused and oblique from costa to vein 5, then indistinct, inwardly oblique, sinuous, with minute black streaks on the veins; postmedial line somewhat diffused at costa, then indistinct with black points on the veins, slightly bent outwards at veins 6·5, then oblique, waved; a slight waved dark terminal line. Hindwing fuscous brown with a greyish tinge slightly irrorated and striated with fuscous; an indistinct oblique antemedial line, obsolete towards costa and with black points on median nervure and vein 1; a black discoidal point; an indistinct minutely waved medial line with black points on the veins, slightly excurved from below costa to vein 6, then oblique and bent outwards at vein 1; a slight waved dark terminal line. Underside greyer; forewing with dark discoidal bar, the terminal area suffused with fuscous from just beyond postmedial line with indistinct greyish patch just before termen from vein 4 to below 3; hindwing with black discoidal point, postmedial line oblique below vein 6 and the termen slightly suffused with fuscous.

Habitat.—KASHMIR, Dana (McArthur); PUNJAB. *Exp.* 46 mill. Type in B.M.

3416. *c.* BOARMIA STICTINEURA, n. sp.

Head, thorax and abdomen greyish mixed with fuscous; fore tibiæ black with pale rings at middle and extremity; mid and hind legs and ventral surface of abdomen paler. Forewing grey-brown with a slight olive tinge and irrorated and striated with fuscous; antemedial line indistinct with black spot on costa and points on median nervure and vein 1, oblique from middle of cell to inner margin; a black discoidal line; medial line diffused and oblique from costa to vein 5, then very indistinct and inwardly oblique; postmedial line with black spot at costa and points on the veins connected by a faint waved line, very oblique below vein 5; a pale dentate subterminal line defined on inner side by diffused dentate dark marks, bent inwards at vein 4 to the angle of postmedial line, then erect to inner margin near tornus; a fine waved dark terminal line with black points in the interspaces. Hindwing grey-brown thickly striated with fuscous; a minutely waved dark medial line with black points on the veins, slightly defined by greyish on outer side; a diffused pale dentate subterminal line defined on inner side by fuscous suffusion and somewhat bent inwards at vein 4; a fine waved dark terminal line. Underside greyer; forewing with the cell tinged with fuscous, a dark discoidal line, the terminal area suffused with fuscous to near postmedial line with grey terminal patch below vein 4; hindwing with discoidal point and indistinct curved postmedial line.

Habitat.—KASHMIR, Kokser, Rala (McArthur). *Exp.* 46 mill. Type in B.M.

3416, *d.* BOARMIA SUBOLIVACEA, n. sp.

♂. Head and th[illegible] brown slightly tinged with olive and fuscous; tarsi with slight pale rings; abdomen [illegible] rated with fuscous. Forewing grey-brown slightly tinged with olive and irrorated and striated with fuscous; antemedial line blackish with black points on the veins, slightly excurved below costa, then oblique; an oblique medial blackish line obsolescent at middle and with minute black streaks on median nervure and vein 2 near base; postmedial line blackish, interrupted, with black points on the veins, slightly incurved below costa, excurved to vein 5, then oblique, sinuous; subterminal line pale defined by fuscous on inner side, waved, incurved from below vein 5 to below 3; a fine waved dark terminal line with blackish points in the interspaces. Hindwing grey-brown irrorated and striated with fuscous; traces of a subbasal line; a more distinct antemedial line with black point at median nervure and small spot at inner margin; a slight discoidal point; a dark medial line with black points at the veins, slightly incurved below vein 4; a pale waved postmedial line defined by fuscous on innerside, slightly angled outwards at discal fold ; a fine waved terminal line with blackish points in the interspaces. Underside greyish ; forewing suffused with fuscous ; hindwing striated with fuscous ; both wings with discoidal points and faint postmedial line incurved below discal fold.

Habitat.—KASHMIR, Kokser, Rala (McArthur). *Exp.* 38 mill. Type in B.M.

3416. *e.* BOARMIA POLYSTROTA, n. sp.

Head, thorax and abdomen grey-brown irrorated with fuscous ; tarsi fuscous with pale rings. Forewing grey-brown thickly irrorated and striated with fuscous ; an indistinct double antemedial line, slightly excurved below costa, then oblique and minutely waved ; an indistinct medial line with small blackish spots at costa and inner margin. discoidal bar and points on median nervure and vein 2, oblique below vein 5 ; a double postmedial line with black points on the veins, slightly excurved below costa, then oblique and minutely waved ; a pale waved subterminal line slightly defined by fuscous on inner side, bent inwards at vein 5, then erect to inner margin near tornus, with slight dark mark beyond it below vein 7 ; a terminal series of black points. Hindwing grey-brown thickly irrorated and striated with fuscous ; an indistinct rather diffused antemedial line ; a slight discoidal striga ; a punctiform medial line and slightly defined by greyish on outer side ; a pale waved subterminal line slightly defined by fuscous on inner side ; a terminal series of black points. Underside of forewing fuscous, the postmedial part of costa tinged with ochreous with dark mark at the faint postmedial line ; a slight discoidal point ; hindwing grey-white irrorated with pale fuscous, a small black discoidal spot and somewhat diffused curved postmedial line.

Habitat.—KASHMIR, Rala, Kokser (McArthur). *Exp.* 36 mill. Type in B. M.

3416. *f.* BOARMIA LEUCOCYMA, n. sp.

♂. Head, thorax and abdomen pale brownish grey irrorated with brown ; palpi dark brown ; antennæ with the basal joint whitish in front ; tarsi fuscous with slight whitish rings. Forewing brownish white irrorated and striated with brown especially on basal, postmedial and terminal areas ; antemedial line double with black points on the veins, excurved below costa, then oblique and slightly waved ; a faint oblique medial line with black points on the veins and discocellulars ; postmedial line indistinct, rather diffused, waved, with series of black points before it on the veins, oblique below vein 5 and excurved at vein 1 ; a waved white subterminal line defined by brown on inner side, bent inwards at vein 5, then erect to inner margin near tornus ; a terminal series of small black lunules. Hindwing brownish white irrorated and striated with brown especially on basal and terminal areas ; an indistinct diffused antemedial line with black points on median nervure and vein 1 ; a double medial line with blackish points on the veins, slightly incurved below lower angle of cell ; a waved white subterminal line defined by brown on inner side and angled outwards at vein 5 ; a terminal series of small black lunules. Underside of forewing suffused with fuscous especially on terminal area, a slight discoidal line and traces of postmedial line; hindwing whitish striated with pale fuscous, a small discoidal spot and indistinct minutely waved postmedial and subterminal lines.

♀. Forewing with the basal and terminal areas paler, the antemedial line single, the medial line more distinct, the postmedial line with the black points on it; hindwing with the basal and terminal areas paler.

Habitat.—KASHMIR, Koksor, Barra Larcha (Mc Arthur). *Exp.* 36-40 mill. Type in B M.

3423. *a.* BOARMIA MIOCROTA, n. sp. (Plate E, f. 5).

Olive yellow thickly irrorated with fuscous. Forewing with the antemedial line represented by obscure black spots on costa and vein 1; a black discoidal spot with obscure grey centre; postmedial line indistinct, dentate, interrupted, erect from costa to vein 5, then oblique to middle of inner margin; an interrupted highly waved grey subterminal line with fuscous patch on its inner side and fuscous streaks in the interspaces from it to the terminal series of black points. Hindwing with the basal area very thickly irrorated; an obscure grey centred black discoidal spot; a curved dentate medial line; a waved greyish subterminal line defined by fuscous on inner side; some black points on termen. Underside brownish grey; forewing with black striæ on costa; both wings with prominent black discoidal spot, postmedial series of short streaks on the veins and fuscous subterminal band expanding towards costa of forewing.

Habitat.—CEYLON, Yatiyantota, Kandy (Green). *Exp.* ♂ 46, ♀ 50 mill.

3434. *a.* BOARMIA ARÆARIA insert *Boarmia nobilitaris*, Swinh., A. M. N. H. (7), xvii. p. 380 (nec. Staud).

3434. *b.* BOARMIA GLAUCOCINCTA, n. sp.

♂. Head, thorax and abdomen grey-white mixed with fuscous brown, forewing grey white thickly irrorated with fuscous brown, a broad ill-defined paler band before the postmedial line; traces of a waved antemedial line with dark points on the veins, oblique from submedian fold to inner margin; a faint dark discoidal short striga; a waved medial line, slightly excurved below costa and ending on inner margin at the postmedial line which is defined by white on outer side, indistinct, waved, with dark points on the veins and the veins before it with slight dark streaks, slightly bent outwards at vein 6, then oblique; traces of a pale waved subterminal line excurved below costa incurved at middle and ending on inner margin near tornus; a terminal series of slight dark points. Hindwing grey-white thickly irrorated with fuscous brown, an ill-defined pale band before the medial line; slight dark subbasal and antemedial marks on inner margin; a minutely waved medial line with darker points on the veins and defined by white on outer side; a waved whitish subterminal line slightly defined by fuscous on inner side; a terminal series of slight dark points Underside grey-white irrorated and striated with pale fuscous; both wings with slight discoidal point; forewing with traces of waved postmedial line; hindwing with slight waved medial and subterminal lines.

ab. 1. ♂. Both wings, with broad whitish band before postmedial line.

ab. 2. ♂. ♀. Both wings with the medial area whitish with a yellowish tinge on outer edge of postmedial line; forewing with the medial part of inner margin tinged with yellowish, a waved whitish subterminal line bent inwards at vein 5, then erect to inner margin near tornus; underside of fore wing with pale patch on terminal area below vein 5, the hindwing whiter.

ab 3. ♀. Both wings with the medial area whiter.

Habitat.—KASHMIR, Kokser (McArthur). *Exp.* 38-44 mill. Type in B. M.

3458. *b.* BOARMIA MELANODONTA, n. sp.

Head and thorax golden-yellow mixed with black, palpi and sides of frons black; vertex of head whitish; abdomen whitish tinged with yellow and irrorated with blackish. Forewing golden yellow with a cupreous tinge prominently irrorated and striated with black, a blackish spot at base and subbasal spots on costa and below cell; a small antemedial spot on costa and a curved series of smaller spots on the veins and in submedian interspace; a discoidal spot; a double postmedial series of small spots on the veins, oblique below vein 4, a diffused white subterminal band with dentate black marks on its outer side from costa to vein 4, and above inner margin, with short whitish streaks on the veins before it, incurved between veins 6 and 4; a terminal series of black spots. Hindwing yellowish white irrorated with small brown spots; a small discoidal spot and terminal series of small black lunules; cilia yellow; the underside more prominently irrorated with brown spots, a blackish discoidal spot and curved postmedial series of small spots.

Habitat.—SIKHIM TIBET, Yatong (Bingham). *Exp.* ♂ 38, ♀ 42 mill. Type in B. M.

3460. *a.* BOARMIA MELAGRAPHARIA, n. sp.

♀. Head and thorax pale rufous irrorated with a few black scales; palpi blackish at tips; frons with blackish bars at middle and above; antennæ ringed with black; tibiæ and tarsi banded with black; abdomen pale rufous irrorated with black. Forewing ochreous suffused with rufous and sparsely irrorated with black, the inner medial area and the outer medial area from costa to vein 5 pale; a black antemedial line excurved below costa and sinuous below the cell, a black medial line oblique and stronger from cell to inner margin; a discoidal point; postmedial line black and with small black spots on it below costa and on inner area, incurved below costa, angled outwards at vein 5, then very oblique, sinuous, incurved in submedian interspace; and angled inwards above inner margin; an indistinct pale waved subterminal line slightly defined by red-brown on inner side; a terminal series of small black lunules. Hindwing ochreous suffused with rufous especially on terminal half and irrorated and striated with black; a black antemedial line defined by red-brown on outer side; a black medial line with series of black points beyond it on the veins, excurved to vein 4, then incurved; an indistinct pale waved subterminal line slightly defined by red-brown on inner side; a terminal series of small black lunules. Underside pale; both wings with black discoidal spot, the lines of upperside indistinct and with a strong black line beyond the postmedial line on forewing, incurved from costa to vein 5, then oblique, on hindwing waved, oblique from costa to vein 5.

Habitat.—BURMA, N. Chin Hills, Lotha Range 8,000′ (Watson). *Exp.* 56 mill. Type in B. M.

3464. *a.* MEDASINA JUNCTILINEA, n. sp.

♀. Head and thorax violaceous grey irrorated with brown; palpi and sides of frons blackish; tegulæ edged with black; patagia with some black on outer edge; abdomen grey irrorated with brown and with dorsal black bands on basal half. Forewing violaceous grey tinged with rufous and irrorated with black; antemedial line blackish with black spot on costa and points on median nervure and vein 1, excurved in cell; medial line with black striæ from costa and on discocellulars and points on the veins, incurved from costa to lower angle of cell, then oblique below submedian fold anastomosing with postmedial line to form a black patch; postmedial line produced to short black streaks on the veins, angled inwards below costa and obliquely incurved below vein 4; subterminal line greyish defined by black on inner side and slightly by fuscous on outer, dentate; a terminal series of small black lunules. Hindwing brownish grey irrorated with black; an indistinct diffused medial line obsolete on costal area; a waved postmedial line from vein 4 to inner margin with black points on the veins; an indistinct pale waved subterminal line defined by brown on inner side; a terminal series of small black lunules; underside greyer; forewing with distinct blackish discoidal spot; hindwing with slight spot.

Habitat.—SIKHIM TIBET, Yatung (Hobson). *Exp.* 48 mill. Type in B. M.

3482. *a.* MEDASINA LELEDARIA. Swinh., A. M. N. H. (7), xv, p. 503 (1905).

♂. Head, thorax and abdomen ochreous brown irrorated with fuscous; branches of antennæ and tips of tegulæ fuscous; abdomen with slight subdorsal fuscous marks on basal segments. Forewing ochreous brown striated with fuscous; antemedial line double, oblique, waved, rather ill-defined, stronger towards costa; a small elliptical discoidal spot; an indistinct double medial line forming a patch at costa, somewhat angled outwards beyond upper angle of cell, then incurved; postmedial line double and somewhat dentate towards costa and inner margin, excurved and reduced to points on the veins between veins 6 and 2, the outer line forming a blotch above inner margin; an indistinct pale waved subterminal line with two ill defined black marks before it at costa and slight spots above and below veins 5 and 2; a terminal series of small black lunules; cilia chequered ochreous and fuscous. Hindwing ochreous brown striated with fuscous; a slight oblique antemedial line; a black discoidal lunule; a somewhat dentate postmedial line produced to slight streaks on the veins; subterminal line represented by a series of whitish lunules with blackish marks before them; a terminal series of small black lunules. Underside of both wings paler, a discoidal black spot, a subterminal band, on forewing covering nearly the whole apical area down to vein 4 and expanding to near termen between vein 3 and submedian fold where it terminates, on hindwing extending from costa to vein 4 and expanding to near termen at vein 6.

Habitat.—BHUTAN ; ASSAM, Khásis, *Exp.* 54 mill.

3484*a*. MEDASINA PALLIDIMARGO, Swinh, A. M N. H. (7), xvi, p. 627 (1905).

Head, thorax and abdomen grey-white thickly irrorated with fuscous, the vertex of head yellowish ; metathorax and base of abdomen with pairs of small black spots. Forewing grey-white tinged with brown especially towards the subterminal line and very thickly irrorated with fuscous : slight blackish spots at base and subbasal spots below costa and cell ; a black antemedial line angled outwards in and below cell, then incurved ; a black discoidal spot with patch on costa above it ; a postmedial bar from costa and an oblique series of points on the veins from vein 4 to inner margin ; an ill-defined maculate subterminal line bent inwards at vein 4 and with white patch beyond it ; the apex whitish, a fine black terminal line somewhat lunulate towards apex. Hindwing whitish thickly irrorated with fuscous ; a small fuscous discoidal spot, crenulate postmedial line, and slight diffused subterminal band with some whitish beyond it at apex and middle ; a fine black terminal line.

ab. 1. Forewing with the postmedial line entire, angled outwards at vein 6, then dentate and bent outwards to inner margin.

Habitat.—KASHMIR ; SIKHIM TIBET, Yatung. *Exp.* 60 mill.

3490*a*. ARICHANNA RUBRIFUSA, n. sp.

♂. Head and thorax red brown ; abdomen violaceous grey. Forewing violaceous grey striated with red brown, the area from medial line to near subterminal line suffused with red-brown ; a strong double slightly waved and somewhat oblique antemedial line ; an oblique sinuous medial line ; an oblique black discoidal bar ; postmedial line obscured by the brown suffusion, double filled in with greyish, incurved below vein 5 ; a brown subterminal line, obsolescent at middle, oblique to vein 5, then slightly incurved some brownish suffusion beyond it at apex and above vein 4 ; a terminal series of black points. Hind-wing pale violaceous grey slightly irrorated with brown ; a dark discoidal striga and traces of postmedial line incurved below vein 4 ; the underside thickly irrorated with brown, a small black discoidal spot ; postmedial line oblique from costa to discal fold, then incurved, a subterminal series of slight dark striæ.

♀. Head and thorax greyer ; forewing greyer, the lines and dark suffusion more prominent leaving a grey patch beyond the cell from costa to vein 5.

ab. 1. Forewing suffused with red-brown to near subterminal line leaving some grey on basal half of inner margin and on costa before middle.

Habitat.—SIKHIM TIBET, Yatong (Hobson, Bingham). *Exp.* 38-46 mill. Type in B. M.

3503. ARICHANNA FLAVINIGRA, n. n.

Arichanna transectata, Hmpsn., Moths Ind., iii, p. 294 (nec. Wlk.).

Habitat.—KASHMIR, Chamba, Duggre (Harford), Jumnotri (Duthie); PUNJAB, Dalhousie (Harford), Dharmsala (Hocking), Kumaon, Ralam Valley (Duthie); SIKHIM TIBET, Yatong (Hobson, Bingham); SIKHIM (Lidderdale). *Exp.* 60-66 mill.

3503. *a.* ARICHANNA TRANSECTATA, Wlk., xxiv, 1112 (1862).

Head and thorax fuscous brown; abdomen greyish fuscous. Forewing olive yellow; the basal area suffused with black; a rather irregular antemedial black line slightly incurved below the cell, followed by a maculate black band from cell to inner margin; an elliptical black orbicular patch and large rounded discoidal patch with blackish above it on costa; a broad medial black band from base of vein 2 to inner margin and two small spots above vein 2; a postmedial series of black spots, incurved below vein 4 and with maculate band before it from costa to vein 4; subterminal and terminal series of large black spots, the former series with the spots from costa to vein 4 almost confluent with the latter. Hindwing orange yellow; the basal area except at costa and inner area to beyond middle suffused with fuscous; a large black discoidal spot with striga above it; a postmedial spot below costa, one beyond the cell with small spot above it and two on inner area; a similar subterminal series with small spots above and below the spot in discal fold and a series just before termen, the spot below apex small and the spot in discal fold bar-shaped, the underside paler with the basal area striated with fuscous.

Habitat.—SIKHIM. *Exp.* ♂ 52, ♀ 58 mill.

3511. *a.* ABRAXAS RUFONOTARIA, Leech, A. M. N. H. (6), xix, p. 451 (1897).

Head and thorax ferruginous brown mixed with some white; antennæ fuscous; tegulæ tipped with orange; pectus and legs orange, the forelegs mostly black, the tarsi black ringed with orange; abdomen orange with paired subdorsal series of black patches. Forewing white, the basal area grey suffused with ferruginous brown and with ill-defined white subbasal line from subcostal nervure to vein 1; the costal area grey expanding into patches with rufous bars on them at and beyond middle; a grey spot at origin of vein 2 and another on vein 4 sometimes connected with the medial maculate band from vein 3 to inner margin with slight waved white line on it with some rufous before it above inner margin; a subterminal maculate band interrupted at middle and connected with the grey terminal area which is also more or less interrupted at middle, leaving a subterminal series of small white spots; a terminal series of brownish spots. Hindwing white with small grey spots at origin of vein 2 and discoidal spot; a maculate medial band interrupted at middle; subterminal and terminal maculate bands more or less interrupted at middle; a terminal series of brown striæ.

Habitat.—W. CHINA; ASSAM, Khasis. *Exp.* ♂ 54, ♀ 58 mill.

3517. *a.* ABRAXAS ARGYROSTICTA, n. sp. (Plate E., f. 23).

Head and thorax dark brown mixed with fuscous yellow and some grey; pectus mostly orange, legs fuscous with some orange at base; abdomen orange with dorsal, subdorsal, lateral and sublateral series of black-brown spots and paired ventral series of patches. Forewing white, the basal area dark olive brown irrorated with silvery blue and with curved outer edge; some medial blue grey striæ on costa and in cell; a large blue-grey patch from costa to median nervure in and beyond end of cell with two medial spots between it and inner margin and an oblique postmedial series; a round dark olive brown discoidal spot with silvery blue, lunule on it; a subterminal maculate blue-grey band, angled outwards at vein 5, then oblique with series of short black streaks on the veins on its inner side and large olive-brown patch on it from above vein 2 to inner margin traversed by a dentate silvery blue line, the area beyond it with blue-grey striæ and medial patch; a terminal series of blackish lunules; cilia fuscous. Hindwing white; the base olive-brown with waved outer edge; a maculate blue-grey medial band expanding into a large patch at middle; a double subterminal band of more or less confluent spots with short black streaks on the veins of inner series and olive brown patch on inner area traversed by a dentate silvery blue line the area beyond it with blue-grey striæ; a terminal series of blackish lunules; cilia fuscous; the underside with the markings greyish fuscous.

Habitat.—MADRAS, Shevaroy Hills (Campbell). *Exp.* ♂ 46, ♀ 56 mill. Type in B. M.

3521. *a.* ABRAXAS POLIOSTROTA, n. sp. (Plate E., f. 18).

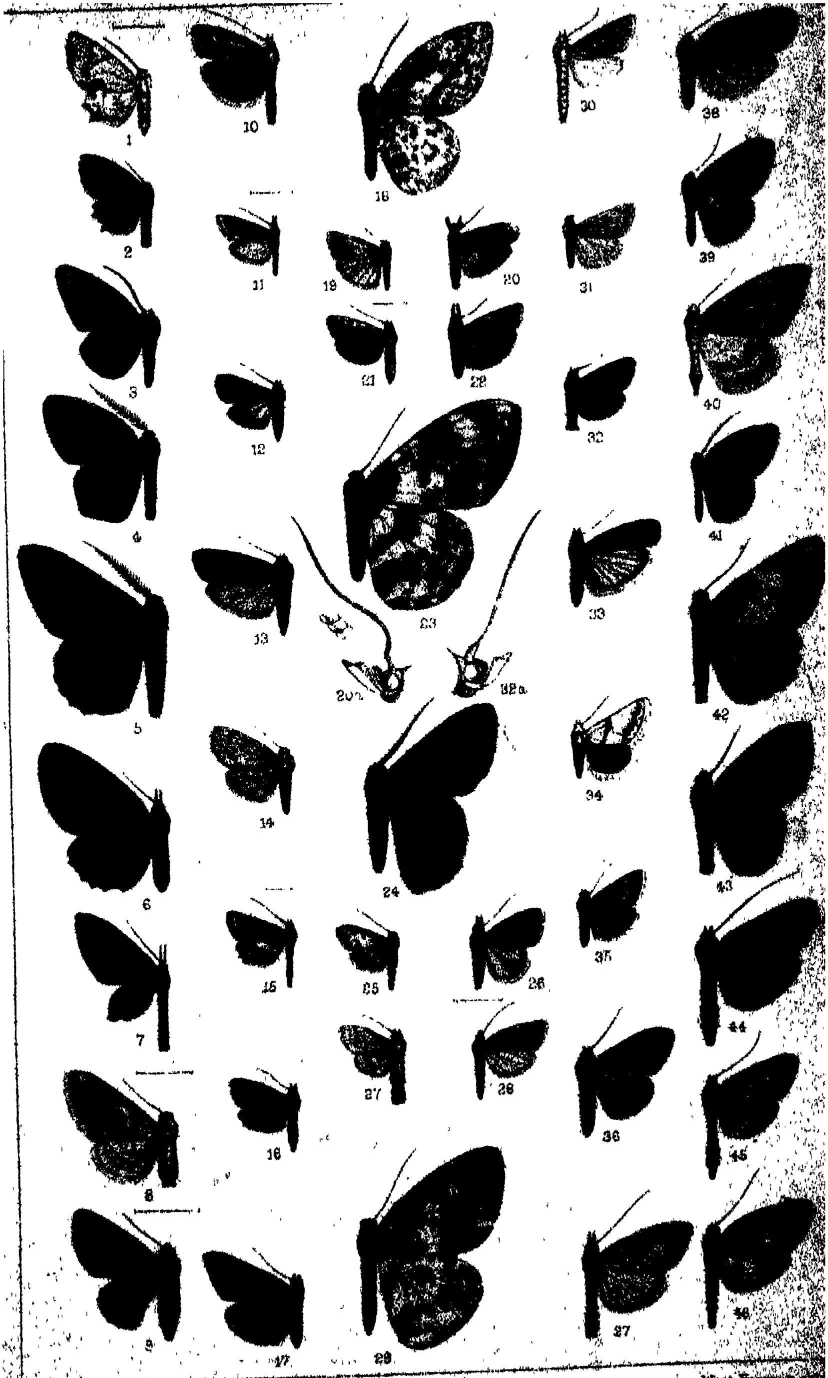
♂. Head fuscous with the vertex yellow; thorax white with some yellowish on shoulders and upper edge of patagia, the tegulæ and dorsum of thorax with fuscous patches, the patagia with fuscous spots; pectus and legs mostly fuscous; abdomen yellow, whitish at base, with dorsal, subdorsal, lateral and sublateral series of black spots. Forewing white with numerous small grey spots and striæ; an oblique grey band from middle of subcostal nervure to inner margin; an ill-defined discoidal spot; a curved postmedial series of small spots from costa to lower angle of cell where it joins an oblique band from costa towards apex, slightly incurved below vein 4; a series of somewhat lunulate spots on the termen and cilia. Hindwing white with numerous small grey spots except before costal half of postmedial band; an ill-defined antemedial band; a discoidal spot, a postmedial maculate band, excurved to vein [illegible], then incurved; a terminal series of spots. Underside with the markings darker.

♀ Paler.

Habitat.—MADRAS, Palni Hills (Campbell). *Exp.* 46-54 mill. Type in B. M.

3524. *a.* ABRAXAS LATIZONATA, n. sp (Plate E, f. 29).

♀. Head and thorax orange; frons, antennæ and streaks behind their bases fuscous black; tegulæ and patagia with black spots; dorsum of thorax fuscous; legs fuscous; abdomen orange with dorsal, subdorsal and subventral series of large black spots and lateral and sublateral series of small spots. Forewing white with small fuscous spots; subbasal and antemedial patches on costa and a medial rather triangular patch; antemedial and medial series of small spots on the veins with points and irregular markings before and between them;



Horace Knight ad nat. lith.

West, Newman imp.

INDIAN MOTHS.

some irregular spots at end of cell; a postmedial patch on costa with curved series of spots from it confluent with a broad band formed of confluent irregular patches oblique from costa to vein 2, then bent outwards; the terminal area with numerous spots; a terminal series of spots and irregular patch at middle. Hindwing white with some small fuscous spots; an antemedial maculate band, irregular discoidal spot, postmedial curved band formed of irregular spots confluent towards costa and inner margin where it is somewhat bent outwards, subterminal series of small spots interrupted at middle and terminal series of lunules.

Habitat.—TRAVANCORE, Pirmad (Mrs. Imray). *Exp.* 50 mill. Type in B.M.

3538. *a.* ABRAXAS LANGUIDATA, Wlk., xxiv. 1122 (1862).

Antennæ of male laminate, almost simple; forewing with veins 7, 8, 9 10 stalked, 11 not anastomosing with 12.

Head and thorax white; frons blackish; antennæ yellowish; shoulders and patagia with fuscous spots; legs yellow with slight fuscous spots; abdomen white tinged with fuscous, the extremity and ventral surface yellow. Forewing white; subbasal and antemedial grey maculate bands; a medial band forking below the cell; an elliptical patch from costa to lower angle of cell; a postmedial bar from costa and spot on inner margin; a large apical patch and subterminal series of spots, the spot below vein 3 displaced inwards; the terminal area striated with grey below the apical patch; cilia fuscous grey. Hindwing white, some grey suffusion on basal area; a discoidal spot; a postmedial spot below costa and two towards inner margin; a subterminal series of spots; a terminal yellow band with fuscous striæ on it; a series of small black spots on termen and cilia.

Habitat.—JAPAN, W. China; NEPAL; ASSAM, Khasis. *Exp.* 50 mill.

3550. *a.* PERCNIA NIGRALBATA, Warr. Nov. Zool., 1, p. 681 (1894).

♀. Vertex of head and front of thorax orange; frons and metathorax white; palpi orange, the 3rd joint black with white tip; frons with black bar; antennæ black; tegulæ, patagia at middle and tips and metathorax with black patches; pectus pale orange; legs fuscous streaked with whitish; abdomen white with subdorsal series of black patches and lateral and sublateral series of spots. Forewing white, the base slightly tinged with yellow; subbasal black spots on costa, below cell and on inner margin; antemedial spots on costa, in and below cell and an oblique bar on inner area; medial spots below costa and in cell, a v-shaped spot on median nervure and base of vein 2, an elongate spot below cell and patch on inner area; an elliptical discoidal spot, a spot above it on costa and irregular spot beyond lower angle of cell; postmedial and subterminal series of large partially confluent spots, the postmedial spot above vein 3 wanting; a terminal series of partially confluent somewhat quadrate patches. Hindwing white; a small spot in cell and discoidal spot; a medial lunulate spot on inner area; a subterminal series of large elongate spots, the spot above vein 8 smaller; a terminal series of rather quadrate spots.

Habitat.—ASSAM, Khasis. *Exp.* 68 mill.

LARENTIANÆ.

3597. *a.* DYSETHIA GLAUCOFUSA, n. sp. (Plate E., f. 40).

Frons with rounded prominence; hindwing with veins 6·7 stalked.

♀. White; palpi and frons slightly tinged with brown. Forewing with the cell and area beyond it to postmedial line, the inner area to cell and vein 2 suffused with grey-green interrupted by traces of a diffused whitish antemedial band; a slight dark discoidal striga; an oblique dark grey-green postmedial band diffused on inner side and not quite reaching costa; a diffused grey-green terminal band leaving a little white on termen. Hindwing white slightly tinged with brown, a discoidal point; a curved postmedial line with some diffused brown on its inner edge; the terminal area suffused with brown.

Habitat.—BELOOCHISTAN, Quetta (Nurse). ♀ type. *Exp.* 40 mill. Type in B. M.

3601. CRYPTOLOMA INDICARIA insert (syn.) *Cryptoloma dentifascia*, Warr. Nov. Zool., xi, p. 489 (1904).

3616.*b.* EUBOLIA POLYGRAMMA, n. sp.

Head and thorax dark brown mixed with ochreous; abdomen ochreous strongly irrorated with fuscous, the basal segment paler. Forewing ochreous thickly irrorated with dark brown; two slight very oblique subbasal dark lines; a stronger antemedial line slightly angled outwards below costa, then oblique and with a fine line beyond it; a small black discoidal spot; a fine brown medial line defined by ochreous on outer side, slightly excurved from costa to vein 5, then obliquely incurved; a strong oblique dark postmedial line defined by ochreous on outer side and with two fine lines beyond it, the outer minutely waved, all three lines slightly incurved below vein 5; a rather diffused minutely waved dark subterminal line defined by ochreous on outer side, the ochreous expanding obliquely to apex: a slight dark terminal line; cilia with a slight brown line through them. Hindwing ochreous white tinged with brown; a slight dark discoidal point with faint brown line from it to inner margin; two medial lines slightly incurved below vein 5; two diffused subterminal lines filled in with brown, the outer slightly waved and defined by ochreous on outer side; terminal area dark brown; cilia with slight brown line through them and series of brown spots; the underside more strongly tinged with ochreous and irrorated with dark brown, the lines darker and more waved.

Habitat.—KASHMIR, Gourrais and Scinde Valleys (Leech); Barra Larcha (McArthur). *Exp.* ♂ 38, ♀ 32 mill. Type in B. M.

3627.*a.* PHIBALAPTERYX RUFIPALPIS, n. sp. (Plate E., f. 6).

♀. Fuscous brown; palpi pale rufous, the base of 2nd and 3rd joints tinged with black; abdomen with slight blackish subdorsal streaks on 1st two segments, the base of legs and ventral surface of abdomen grey. Forewing minutely irrorated with raised grey scales; oblique waved black subbasal and medial lines interrupted in places, the former angled outwards below costa, the latter below costa and on median nervure; an inverted comma-shaped discoida tuft of black scales; postmedial line represented by a series of small dentate grey and black marks with traces of another line before it, oblique from costa to vein 5, then inwardly oblique; a subterminal series of small pure white spots on slight blackish streaks extending to termen; a series of white points at base of cilia. Hindwing with indistinct waved subbasal, medial and postmedial lines, the last curved and with a series of minute white and black marks on its inner side; a subterminal series of small white spots on slight blackish streaks extending to termen. Underside grey, both wings with black discoidal spots, postmedial line excurved at middle with slight dark streaks at the veins and subterminal series of diffused rather wedge-shaped marks.

Habitat.—MADRAS, Palni Hills (Campbell); CEYLON, Maskeliya (Pole). *Exp.* 46 mill. Type in B. M.

3653. CIDARIA MEDIOVITTARIA insert (syn.) *Somatina azonaria*, Oberth. E. Ent., xviii, p. 32, pl. iv, f. 50 (1893).

3670*a*. CIDARIA SCOTARIA, n. sp. (Plate E., f. 43).

Antennæ of male minutely serrate and fasciculate.

Head, thorax and abdomen black brown with a reddish tinge and some leaden grey suffusion. Forewing dark reddish brown irrorated with glistening scales, and with numerous indistinct waved lines, of which the most distinct are a subbasal line, two antemedial lines, a medial line angled outwards beyond lower angle of cell and two postmedial lines slightly excurved below costa and at middle; a subterminal series of slight whitish marks with blackish marks on their inner side and more distinct spots above veins 6 and 5. Hindwing greybrown irrorated with glistening scales; a whitish mark on termen towards tornus; the underside paler with dark point at upper angle of cell, sinuous medial line and two indistinct minutely waved subterminal lines.

Habitat.—CEYLON, Pattipola (Green). *Exp.* 42 mill. Type in B. M.

3748*c*. NEOSCELIS MELACHLORA, n sp. (Plate E., f. 9).

♀. Head and thorax fuscous mixed with rufous and grey; patagia with small white spot on upper edge; abdomen green with black irroration at sides; pectus and abdomen below whitish; legs streaked with fuscous, the tarsi with white rings. Forewing green irrorated with black to the waved black medial line; a black discoidal lunule; the terminal half purplish red-brown; an indistinct curved postmedial line defined by greyish on inner side; subterminal line dentate, only defined by the area before it being suffused with fuscous and the terminal area greyish; a black terminal line; cilia fuscous with fine ochreous line at base and intersected with ochreous. Hindwing grass green irrorated with black; a black discoidal bar; ill-defined black antemedial, medial and postmedial lines and a dentate subterminal line; a terminal line; cilia pale fuscous with fine ochreous line at base.

Habitat.—CEYLON, Uva (G. O. Alston). *Exp.* 24 mill. Type in B. M.

3750. GYMNOSCELIS *deleta* insert *Eupithecia* SEMIALBIDA, Wlk., xxxv, 1678 (1866), Swinh., Cat. Het. Mus., Oxon., II., pl. 5, f. 16, which precedence ... ...

3764.*a*. GYMNOSCELIS PERANGUSTA, Warr. Nov. Zool. iv., p. 229 (1897).

Head, thorax and abdomen pale rufous irrorated with black; antennæ ringed whitish and fuscous. Forewing pale rufous suffused in parts with deeper rufous and fuscous and slightly irrorated with black; diffused subbasal and antemedial lines of black and grey scales, angled outwards below costa, then oblique and waved; a medial line with dark suffusion before it, oblique towards costa, excurved in cell, then incurved and with a fine white line beyond it, excurved from costa to lower angle of cell, then oblique, minutely waved; postmedial line double filled in with whitish with some darker rufous suffusion before it, oblique from costa to vein 6 and incurved below vein 4, the area beyond it dark except towards costa and between veins 4·3; a fine waved, curved white subterminal line; a fine dark terminal line; cilia fuscous with a series of ochreous points. Hindwing ochreous mostly suffused with rufous and slightly irrorated with black; traces of a rufous antemedial line with some black scales at median nervure and vein 1; a double postmedial line filled in with whitish and with some black scales beyond it on the veins, minutely waved, the area beyond it more ochreous; an indistinct double minutely waved subterminal line; a slight dark terminal line; cilia ochreous mixed with fuscous.

Habitat.—CEYLON, Colombo (Mackwood), C. Province (de Mowbray); SINGAPORE; BORNEO, Sarawak; MARQUESAS, Nuka Hiva I. *Exp.* 20 mill.

p. 890. Under CHLOROCLYSTIS insert *Mariaba*, Wlk., xxxv., 1696 (1866), type *convoluta*.

3768. CHLOROCLYSTIS *emarginaria* insert *Acidalia* REFUSARIA, Wlk., xxiii, 767 (1861), and *Eupithecia subtrita*, Wlk., xxxv., 1675 (1866) which have precedence ... ... Borneo.

Sect. (*Mariaba*). Hind tibiæ with the inner medial and outer pair of spurs immensely long and dilated at extremity; forewing very broad, the inner margin strongly lobed except at base and fringed with long hair; hindwing with the termen except at apex and inner area towards tornus rolled over on underside so that the termen is angled below apex and the tornus produced to a point, the scaling thick and the neuration distorted.

3772. *a*. CHLOROCLYSTIS MEDIOPLAGA, Swinh., Trans. Ent. Soc., 1902, p. 651.

♂. Head, thorax and abdomen yellow, the thorax and basal part of abdomen irrorated with black. Forewing yellow mostly suffused with greenish fuscous; an indistinct double curved antemedial line; a black discoidal spot; traces of two double, curved, minutely waved postmedial lines; a more distinct yellow, minutely waved subterminal line, with a yellowish patch beyond it at middle; a fine dark terminal line; cilia fuscous with a fine yellow line at base. Hindwing yellow with black striga on inner margin above tornus. Underside of forewing with dark band from costa to upper angle of cell, postmedial and [illegible] from costa to vein 2 and a terminal band; hindwing with

3787. *a*. EUPITHECIA LEUCOSPILA, Swinh., A. M. N. H. (7), xvii, p. 380 (1906).

♂. Head, thorax and abdomen red-brown; vertex of head white, pectus whitish; legs whitish banded with brown; abdomen with dorsal series of small white spots, the anal tuft and ventral surface whitish. Forewing red-brown; a waved subbasal white line from costa to submedian fold; antemedial white spots on costa, median nervure and vein 1, with blackish marks before and beyond them; a black discoidal spot; an excurved white medial band from costa to lower angle of cell, a spot at base of vein 2 and slight streak in submedian fold; a double postmedial maculate white band with blackish marks on the veins between the spots, excurved from costa to vein 5, then oblique and ending in a single spot on vein 1; a subterminal series of small black and white spots, obsolescent towards apex, larger towards tornus; a terminal series of dark striæ; cilia with a series of white spots. Hindwing pale, the inner half suffused with red brown and with antemedial, medial, postmedial and subterminal small white spots on the veins with dark streaks between them; a terminal series of dark striæ; cilia with series of white spots.

Habitat.—ASSAM, Khasis. *Exp.* 22 mill.

3787. *b*. EUPITHECIA ALBIFURVA, n. sp. (Plate E., f. 8).

♀. Head, thorax and abdomen white; palpi fuscous; abdomen dorsally tinged with fuscous except at base and with rufous segmental lines towards extremity. Forewing white, the terminal half suffused with brick-red; the costa with patches of fuscous; traces of minutely waved lines on basal half; a black discoidal point; an ill-defined double minutely waved postmedial white line; a waved white subterminal line; a terminal series of black striæ. Hindwing white with six indistinct waved lines, almost obsolete on basal area; a discoidal point; a terminal series of black striæ.

Habitat.—CEYLON (de Mowbray). *Exp.* 24 mill. Type in B. M.

3810. *a*. SAURIS LOBATA, Warr. Nov. Zool, ii, p. 107 (1895).

Differs from *hirudinata* in the termen of forewing having a deep incision above vein 2, hindwing with the lobe larger.

Head and thorax olive green; antennæ black; pectus, legs and abdomen brownish ochreous. Forewing olive green with pale raised shining scales; eleven irregular waved deeper green lines with some fuscous on medial part of 1st antemedial line, on costal area of the two medial and three postmedial lines, on the medial part of the three postmedial lines; a green discoidal bar; the subterminal line fuscous and formed of rather dentate marks; a terminal series of black points. Hindwing fuscous, the basal vesicle and area near the black medial lobe pale.

Habitat.—CEYLON, Kandy (Mackwood); MALACCA, Padang; BORNEO, Pulo Laut. *Exp.* 34 mill.

3811. *a*. SAURIS METAPHÆA, n. sp. (Plate E., f. 7.)

Differs from *hirudinata* in the hind tibiæ of male [illegible] extremity; hindwing with the vesicle [illegible] with a pencil of long black hair from it on underside, the termen with the lower lobe produced and as long as the middle lobe.

Head and thorax olive green; antennæ black; pectus, legs and abdomen grey tinged with fuscous, the last with the basal segment ochreous on dorsum with a black segmental line. Forewing olive-green with eleven irregularly waved narrow fuscous bands, the olive area with raised shining scales; an oblique black discoidal bar; the postmedial line angled outwards below veins 6 and 4 and above 2, the subterminal line forming somewhat dentate marks. Hindwing uniform pale fuscous, the terminal lobe in male black.

Habitat.—CEYLON, Maskeliya (J. Pole). *Exp.* 32 mill. Type in B.M.

ACIDALIANÆ.

3864. *a.* CRASPEDIA POLYSTIGMARIA insert (syn.) *Craspedia elyra*, Swinh., A. M. N. H. (7), xvi, p. 628 (1905).

3896. *b* ACIDALIA CARPHEBARIA insert (syn.) *Anthometra unipuncta*, Swinh., A. M. N H. (7) xvi, p., (1905).

3896. *d.* ACIDALIA PHÆNICEARIA, n sp. (Plate E, f. 39).

♀. Head ochreous; palpi and sides of frons tinged with purple; thorax purplish red; abdomen ochreous with dorsal purplish bands on basal segments; legs yellowish tinged with purple; pectus and ventral surface of abdomen white. Forewing purplish red overlying ochreous; traces of an antemedial line, oblique from costa to submedian fold, then waved; a dark discoidal spot, postmedial line defined by ochreous on outer side, oblique from costa to vein 6, incurved at discal fold, then excurved to vein 2 and incurved to inner margin; a fine red terminal line; cilia pale at tips. Hindwing purplish red overlying ochreous; a slight discoidal point; postmedial line slightly defined by ochreous on outer side, incurved from costa to vein 5, then excurved; a fine red terminal line; cilia pale at tips. Underside of both wings ochreous, the terminal area suffused with purplish red.

Habitat.—AFGHANISTAN, Peshin Valley (Nurse). *Exp.* 26-30 mill. Type in B.M.

3909. *b.* ACIDALIA PHŒNICOGLAUCA n. sp.

♀. Head, thorax and abdomen pale olive suffused with dull purplish red, forewing pale olive suffused and irrorated with dull purplish red; a slight dark subbasal mark on median nervure; an indistinct rather oblique pale olive antemedial line not quite reaching costa; a black discoidal point; an indistinct curved olive subterminal line; the terminal half of inner area and the terminal area except at apex pale olive with hardly any purple suffusion. Hindwing pale olive suffused and irrorated with dull purplish red except the termen; indistinct minutely waved olive postmedial and subterminal lines; a series of slight dark points at base of cilia; the underside olive whitish, slight sinuous reddish medial and postmedial lines and a pale minutely waved subterminal line defined on each side by purplish red, a black discoidal point.

♂. Head, thorax and abdomen pale pink slightly irrorated with brown; abdomen with paired dorsal black points on basal segments; pectus legs and ventral surface of abdomen yellowish; wings pale pink irrorated and striated with brown especially on medial area; the termen brown, the cilia golden yellow. Forewing with the costal area tinged with brown; a black discoidal spot; traces of a curved postmedial series of dark points on the veins. Hindwing with silvery white discoidal spot edged by red or brown; traces of a postmedial series of points on the veins.

♀. More thickly striated and suffused with brown; the terminal brown band broader especially on hindwing.

Habitat.—ASSAM, Khasis. *Exp.* ♂ 22, ♀ 26 mill.

3921. *a.* CHRYSOCRASPEDA FULVIPLAGA, Swinh., A. M. N. H. (7), xv., p. 165 (1905).

Head and thorax purplish pink; frons whitish in male; legs partly yellow; abdomen yellow, dorsally purplish pink to near extremity. Forewing golden yellow almost entirely suffused with purplish pink, leaving striations of the ground colour, the costa towards apex and the termen yellow; an oblique antemedial yellow line slightly angled outwards in cell; a fuscous discoidal spot; postmedial line yellow, slightly sinuous, oblique from costa to vein 3, then subterminal and incurved; the pink suffusion extending to termen at the angle at vein 3. Hindwing purplish pink; an antemedial yellow line angled outwards at median nervure; a large postmedial diamond shaped yellow patch from vein 7 to inner margin connected with costa by a short line, its outer edges angled outwards at vein 4 and with traces of small dark spots on the veins; termen mostly yellow; cilia yellow with some purplish pink at the angles at veins 4·3.

Habitat.—ASSAM, Khásis. *Exp.* ♂ 26, ♀ 32 mill.

3927. ANISODES ABSCONDITARIA del. *Anisodes patruelis.*

3927. *a.* ANISODES PATRUELIS, Moore, Lep. Ceyl., iii, p. 444, pl. 199. f. 10 (1887).

Hind tibiæ of male rather short with three long curved spurs from extremity and a slight tuft of crimson hair.

♂. Red-brown; palpi pale below. Forewing with the antemedial line represented by a series of dark points angled in cell, then oblique; a black edged white discoidal point; postmedial line indistinct, dentate, fuscous, excurved from costa to vein 4, then incurved; a subterminal series of black points slightly incurved at discal fold; a terminal series of points and some points at base of cilia. Hindwing with large round white discoidal spot with fuscous centre and edges; a postmedial series of black points incurved at discal fold; a terminal series of points and some points on the cilia.

♀. Hindwing with the discoidal spot pure white edged with black, either large or minute.

Habitat.—CEYLON, Newera Eliya, W. Haputale, Maskeliya, Pundaloya. *Exp.* 36 mill.

3957. *b* LEPTOSIDIA ÆARIAAR insert *Rhodostrophia anomala*, Warr. Nov. Zool. ii, p. 98 (1805), which has priority.

GEOMETRINÆ.

4008. *a*. PSEUDOTERPNA NEONOMA, n. sp. (Plate E., f. 24).

Head and thorax pale red-brown; patagia and prothorax with slight fuscous marks, metathorax with slight fuscous streaks; pectus and base of legs whitish, the tarsi banded with fuscous; abdomen red-brown with fuscous streaks on 1st segment, oblique black streaks on 2nd segment, the crests with black and silvery scales, lateral black fasciæ on 2nd and 3rd segments, the ventral surface white. Forewing pale red-brown striated with black-brown except towards base and slightly tinged with olive-green; a dark subbasal line from costa to vein 1; an oblique slightly sinuous black antemedial line; an elliptical brown spot at upper angle of cell; postmedial line black, minutely dentate, slightly incurved and with a faint line before it from costa to vein 4, then oblique; a diffused brown curved brand from costa before apex to vein 5, with slight white marks on its outer edge, the area beyond it greyish; a fine waved black terminal line. Hindwing pale red-brown irrorated and striated with dark brown; postmedial line fine black excurved below costa, then very oblique to vein 4, then dentate to inner margin just beyond middle, a faint red-brown shade beyond it between veins 6 and 4; a fine slightly waved black terminal line. Underside white; forewing with fuscous striæ on costa, a faint antemedial line, blackish discoidal spot, postmedial line oblique below vein 4, the area beyond it suffused with fuscous except towards tornus; hindwing with slight discoidal striga and postmedial line from costa near apex to tornus diffused between veins 7 and 4 and below vein 3.

Habitat.—CEYLON, Puttalam (Pole). *Exp.* 42 mill. Type in B. M.

4025. *b*. PSEUDOTERPNA OCHREIPICTA, Swinh., A. M. N. H. (7), xv, p. 166 (1905).

♂. Head and thorax sap-green; abdomen green irrorated with fuscous; pectus, legs and ventral surface of abdomen ochreous; tarsi fuscous; wings pale green thickly striated and mottled with dark sap-green. Forewing with traces of a waved antemedial line defined on inner side by a few leaden scales and with a flesh-coloured spot before it on inner margin; postmedial line minutely dentate, defined by leaden scales on outer side and with small flesh-coloured spots beyond it above vein 5 and at inner margin, oblique from costa to submedian fold, then bent outwards; a terminal series of black points. Hindwing with small discoidal spot; minutely dentate postmedial line defined by leaden scales on outer side and with a flesh-coloured spot beyond it at inner margin; a terminal series of black points. Underside pale yellow, both wings with round black discoidal spots and broad fuscous postmedial band with fuscous striation beyond it, on forewing extending to termen, on hindwing the band attenuating and not quite reaching inner margin.

Habitat.—ASSAM, Khásis. *Exp.* 48 mill.

4077. **EUCHLORIS DETRACTA** insert (syn.) *Microloxia vestigiata*, Swinh., A. M. N. H. (7), xvi, p. 629 (1905).

4084. *a.* **EUCHLORIS ALBIDENTULA**, n. sp. (Plate E., f. 41).

Rather pale sap-green; palpi and frons brownish; base of shaft of antennæ, and a band between their bases pure white; legs brownish. Forewing with slight silvery irroration especially on costal area; the costal edge brownish; antemedial line arising from subcostal nervure, slightly angled in submedian fold and defined by whitish on inner side; a dark green discoidal point; postmedial line arising from below costa, oblique, dentate, incurved in submedian fold, defined by silvery white on outer side. Hindwing with green discoidal bar; postmedial line dentate, incurved to inner margin, slightly defined by white on outer side; the underside greenish grey with a slight purple pink tinge.

Habitat.—CEYLON, Maskeliya (Green). *Exp.* 26 mill. Type in B. M.

(*To be continued.*)

THE FLORA OF ADEN.

By E. Blatter, S.J.

(*Continued from page 920 of Vol. XVII of this Journal.*)

Having enumerated the plants of Aden, we now proceed to give the physical aspects of the peninsula.[1] Aden, which is almost the most southerly point on the south coast of the Province of Yemen in Arabia Felix, is situated in latitude 12° 47′ N., and longitude 45° 10 E. It is about fifteen miles in circumference, of an irregular oval form, five miles in its greater, and three in its lesser diameter, connected with the continent by a low narrow neck of land 1,350 yards in breadth, but which is in one place nearly covered by the sea at high spring tides. The peninsula consists of a large crater, formed by lofty and precipitous hills, the highest peak of which rises as high as 1,775 feet. On the exterior side the hills slope towards the sea, throwing out numerous spurs, which form a series of valleys, radiating from a common centre. Some of the spurs, falling almost abruptly into the sea, are nearly inaccessible. On the eastern face, opposite the fortified island of Seerah, there exists a gap. The appearance of the island would induce the belief, that it had at one time completed the circle, but that, having been separated by some convulsion of nature, it had been carried out and deposited in the sea, a few hundred yards in advance of the gap caused by its removal. The inlet thus formed is known by the name of Front or East Bay.

There is also a cleft from north to south, and the rents thus produced are called the Northern and Southern Passes; the former, better known as the Main Pass, is the only entrance from the harbour into the town, which is situated within the crater.

Between the northern shore of the peninsula and the south coast of the continent stretches the principal harbour or Back Bay with a width of about three miles at the entrance. As to its geological aspect, Aden is entirely of volcanic rock. The crater, as it now stands, has a diameter of 1½ to nearly 2 miles, the height of the walls, except where broken through at Front Bay, varying from a few hundred to nearly 1,800 feet. The crater, however, as well as the whole volcanic mass has been greatly altered by the action of the sea and rain since the time when the volcano was active. "To passing travellers," says Mallet, "it may appear strange to speak of pluvial denudation at Aden, but residents of the place are well acquainted with its force and extent. Rain seldom falls, it is true, but when it does it generally comes down in torrents. Of Aden it may be said with some degree of truth that there 'it never rains but it pours'. During the last fall which has occurred there (1870) seven inches fell in a couple of hours. The water swept along the torrents, filling all the drains with stones, many of them bigger than a man's head, and doing considerable damage to the station. Such very heavy falls only occur once in ten years or so, but other smaller but still heavy ones occur at shorter intervals."[1] The varieties of rock met with are very numerous. There are perfectly compact lavas of brown, grey, and dark green tints; besides, rocks exhibiting every degree of vesicularity until we arrive at lavas resembling a coarse sponge and passing into scoriæ. In some places the lava is quite schistose, and might if seen *per se* be easily mistaken for a metamorphic rock. Also volcanic breccias are met with, as near the Main Pass where fragments of dark green lava are imbedded in a reddish matrix.[2]

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[1] Cf. R. L. Playfair, A History of Arabia Felix or Yemen (Select. from the Rec. of the Bombay Government, 1859) and F. M. Hunter, An Account of the British Settlement of Aden in Arabia, 1877.

The climate of Aden during the north-east monsoon (October to April) is cool, and in the months of November, December, and January pleasant and agreeable. During the rest of the year hot sandy winds known as "Shamal," or north, prevail within the crater. On the western side, however, or Steamer Point, the breezes coming directly off the sea, are cool and refreshing. Vanden Broeck, who visited Aden in 1614, was witness of the "Shamal" and described it thus: "About noonday there came upon the earth a surprising darkness, followed by very heavy rain, and in the further extremity of that terrible cloud a very bright red, that might almost be mistaken for a fiery oven. The cloud continued to roll away towards Ethiopia, the rain ceased, and we were surprised to find our vessel covered with red sand, to the thickness of a finger's breadth. Some intelligent inhabitants informed us that these winds were formed of the sea-sand, and often buried whole caravans."[3] Playfair calls this a tolerably accurate description of the 'Shamal", but he adds that usually it is not accompanied by rain, nor ever so serious in its results. Anderson gives us a vivid description of the climate of Aden in his Florula Adenensis. "In so low a latitude," he says, "the sun shines with intense force nearly throughout the year, and at Aden the solar power is increased by every peculiarity of physical conformation and climate. The undisturbed atmosphere stagnates in the walled in valleys, where a death-like stillness always reigns. The black and naked rocks absorb by day the scorching rays transmitted through an ever cloudless sky, only to radiate the pent-up heat by night, thus confining to the shore the cool but feeble breezes that occasionally spring up from the Indian Ocean. Accordingly, even in December, when the sun's power is at its lowest, Dr. Hooker found the temperature of the soil at 107° Fahr. a few feet below the surface. In the hotter seasons of the year, the sun, even in the early morning, is overpowering, and above the rocks the air flickers from the intense heat, while all distant objects are disturbed by an imperfect mirage." The following thermometrical readings confirm Anderson's sketch. They give the average temperature during the year at the three military positions: Camp, Isthmus, and Steamer Point:—

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[1] F. R. Mallet, Memoirs of the Geol. Surv. of India, Vol. VII, Part 3, p. 4.

[2] Cf. F. R. Mallet, l.c.

[3] Hist. Gen. des Voyages, XXXI, 426.

CAMP.

Months.	1873-74.			1874-75.			1875-76.		
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.
April	88	82	85	92	81	86·5	86	77	81·5
May	91	86	88·5	97	86	91·5	90	80	85
June	95	90	92·5	103	89	93·5	94	84	89
July	97	90	93·5	100	80	90	96	86	91
August	96	90	93	95	75	85	94	84	89
September	93	88	90·5	95	84	89·5	91	81	86
October	89	84	86·5	92	73	82·5	87	78	82·5
November	85	84	84·5	85	70	77·5	85	76	80·5
December .. .	81	79	80	84	67	75·5	82	72	77
January	80	77	78·5	84	66	75	78	71	74·5
February	83	79	81	82	71	76·5	78	72	75
March	84	81	82·5	86	75	80·5	82	79	80·5
Average ..	88·5	84·1	86·3	91·1	76·5	83·8	86·9	78·3	82·6

ISTHMUS.

Months.	1873-74.			1874-75.			1875-76.		
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.
April	97	82	89·5	89	79	84	86	83	84·5
May	88	84	86	96	83	89·5	90	87	88·5
June	93	87	90	101	86	93·5	98	80	91
July	93	88	90·5	99	83	91	98	88	90·5
August	93	87	90	97	82	89·5	92	86	89
September	90	85	87·5	98	84	91	90	87	88·5
October	85	80	82·5	92	77	84·5	86	77	81·5
November	81	78	79·5	85	73	79	81	88	79·5
December	79	76	77·5	81	72	76·5	78	76	77
January	78	75	76·5	80	71	75·5	78	76	77
February	80	77	78·5	80	74	77	77	74	75·5
March	82	79	80·5	87	79	83	81	80	80·5
Average	86·5	81·5	84	90·4	78·5	84·5	85·4	82·5	83·4

STEAMER POINT.

Months.	1873-74.			1874-75.			1875-76.		
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean
April	99	79	84·5	88	78	83	90	80	
May	91	83	87	88	85	89	92	83	87·5
June	93	84	88·5	95	84	89·5	93	86	89·5
July	92	84	88	92	82	87	90	84	87
August	92	85	88·5	88	80	84	90	52	86
September	91	84	87·5	92	84	88·5	93	85	89
October	88	77	82·5	89	78	83·5	89	79	84
November	84	76	80	84	74	79	86	74	80
December	81	74	77·5	82	72	77	82	73	77·5
January..	80	74	77	80	70	75	81	75	78
February	82	75	78·5	81	70	77·5	81	75	78
March	86	77	81·5	86	78	82	84	77	80·5
Average	87·5	79·8	83·4	87·6	77·7	82·6	87·2	79·4	83·5

The annual rainfall at Aden rarely exceeds 6 or 7 inches, while occasionally there falls no rain for a year and a half. The subjoined readings give the registered rainfall in the Crater since 1871; previous to that year the maximum recorded in the preceding eleven years was 8·03 inches in 1870, while in 1871 the fall amounted to 24 cents only.[1]

Rainfall registered at the Civil Hospital in the Crater.

Months.	1872-73.		1873-74		1874-75.		1875-76	
	Inches	Cents	Inches	Cents.	Inches.	Cents.	Inches.	Cents.
April	1	9	0	0	0	0	0	0
May	0	20	0	[illegible]	0			
June	0	0	0	0	0	0	0	0
July	0	41	0	2	0		0	0
August	0			27	1		0	0
September	0	21	1	28	0	0	0	0
October	0	0	0	0	0	0	0	0
November	0	0	0	12	0	5	0	22
December	0	42	0	11	0	0	0	18
January	0	85	0	45	0	0	1	
February	0	0	0	0		42	0	17
March	4	58	0	0		0	1	65
Total				85		05		78

As the hills on the western side of the Crater are precipitous, the rain-water descending from them is carried rapidly to the sea by means of a number of long narrow valleys unconnected with each other; on the eastern side the hills are quite as abrupt, but the descent is broken by a large tableland occurring midway between the summit and the sea-level, which occupies about one-fourth of the entire superficies of Aden. The plateau is intersected with numerous ravines, nearly all of which converge into one valley, which thus receives a large proportion of the drainage of the peninsula. Thus we can easily understand how the steepness of the hills, the hardness of the rocks, and the scarceness of the soil upon them combine to prevent any great amount of absorption. Almost perpetual drought is, of necessity, the consequence of such physical and meteorological conditions.

Aden has been described by Ibn Batuta as a large city without either seed, water, or tree.[2] But it is not so entirely destitute of vegetation as might be inferred from this description. Many of the valleys are thickly studded with small trees and shrubs, producing beautiful flowers, and it is no uncommon circumstance for the inhabitants of Sheikh Othman (a village distant about 4 miles from the British frontier) to send their goats and camels to find pasturage amongst the valleys on the west side of the peninsula, when none is procurable in their own district.[1]

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[1] Cf. Hunter, E. C.

[2] Travels of Ibn Batuta; translated by the Rev. Samuel Lee, London, 1829, page 55.

We must, nevertheless, call the flora of Aden a very poor one if we compare the total of species with the considerable area they occupy. In our list we gave the names of 196 plants, which are representatives of 47 orders and 114 genera. The accompanying table will show the small proportion of species to the number of genera and natural orders.

Orders.	Genera.	Species.	Orders.	Genera.	Species.
1. Menispermaceæ	1	2	25. Salvadoraceæ	1	2
2. Cruciferæ	2	2	26. Apocynaceæ	1	2
3. Capparidaceæ..	5	17	27. Asclepiadaceæ	4	5
4. Resedaceæ	1		28. Boraginaceæ	3	6
5. Polygalaceæ	1	2	29. Convolvulaceæ	3	4
6. Caryophyllaceæ	4	6	30. Solanaceæ	1	1
7. Portulacaceæ..	1	1	31. Scrophulariaceæ	5	6
8. Malvaceæ	3	3	32. Acanthaceæ	2	2
9. Sterculiaceæ	2	2	33. Verbenaceæ	1	2
10. Tiliaceæ	2	4	34. Labiatæ	3	3
11. Zygophyllaceæ	3	5	35. Nyctaginaceæ..	1	2
12. Burseraceæ	1	1	36. Amarantaceæ	2	2
13. Rhamnaceæ	1	2	37. Chenopodiaceæ	5	8
14. Vitaceæ	1	1	38. Aristolochiaceæ .. .	1	1
15. Moringaceæ	1	1	39. Euphorbiaceæ .. .	4	10
16. Leguminosæ	10	28	40. Urticaceæ	1	2
17. Combretaceæ	1	1	41. Gnetaceæ	1	1
18. Loasaceæ	1	1	42. Amaryllidaceæ	1	2
19. Cucurbitaceæ	3	5	43. Liliaceæ	1	1
20. Ficoideæ	4	5	44. Commelinaceæ	1	1
21. Umbelliferæ	1	1	45. Naiadaceæ	1	2
22. Rubiaceæ	1	1	46. Cyperaceæ	1	3
23. Compositæ	6	7	47. Gramineæ	14	26
24. Plumbaginaceæ	1	2	Total ..	114	196

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[1] Playfair, l. c., p. 6.

These tables show that there exists a great preponderance of natural orders and genera compared with the number of species. The proportion of natural orders, genera and species is 1 : 2·42 : 4·17, whilst on the neighbouring Socotra, an island in the Indian Ocean, the vegetation shows the following proportion according to Krause : 1 : 4 : 7. This seems to indicate that the paucity of species in the flora of Aden is not the result of situation or isolation, but the necessary consequence of the meteorological factors combined with unfavourable edaphic conditions. Of the 196 species, 35 are Monocotyledons, chiefly represented by the Gramineæ, and 160 Dicotyledons which owe the high number especially to the Leguminosæ with 28 species and to the Capparidaceæ with 17 species.

With regard to the geographical distribution of the Aden plants we may distinguish five groups.[1] To the first belong the species which are endemic in Aden. Anderson considered 14 out of his 94 plants to be endemic, *viz.*, *Cleome paradoxa*, R. Br.; *Cleome pruinosa*, T. Anders.; *Mærua thomsoni*, T. Anders.; *Sphærocoma hookeri*, T. Anders.; *Hibiscus welshii* T. Anders.; *Sterculia arabica*, T. Anders; *Tavernieria glauca*, Edgew.; *Acacia edgeworthii*, T. Anders.; *Ptychotis arabica*, T. Anders.; *Convolvulus sericophyllus*, T. Anders.; *Anarrhinum pedicellatum*, T. Anders.; *Campylanthus junceus*, Edgew.; *Lavandula setifera*, T. Anders.; *Euphorbia systyla*, Edgew. Later botanical explorations, especially in South-Arabia, Eritrea, Somaliland and Socotra, have shown that only three of the 14 are endemical in Aden, *viz.*, *Hibiscus welshii*, T. Anders.; *Mærua thomsoni*; T. Anders.; *Cleome pruinosa*, T. Anders. Besides these the following species seem to be confined to Aden:—*Albuca yerburyi*, Ridl.; *Crotalaria schweinfurthii*, Defl.; *Fagonia glabra*, Krause; *Polygala thurmanniana*, Chod.; *Heliotropium adenense*, Guerke. It is more than probable that further explorations of the neighbouring countries will reduce even this limited number of endemic plants, for it is very little we know, *v. g.*, of the interior of Arabia and its vegetation.

The plants belonging to the second group belong geographically to two narrow strips of land along the Red Sea, beginning at about 28° N. Lat., the one on the African side passing over into the coast region of Somaliland, whilst the other one comprises Tehama and goes as far as the boundaries of Yemen and Hadramaut. Aden has the following species in common with this area :—*Argyrolobium arabicum*, *Tephrosia pogonostigma*, *Acacia hamulosa*, *Statice axillaris*, *Statice cylindrifolia*, *Heliotropium pterocarpum*, *Schweinfurthia pterosperma*, *Linaria macilenta*, *Halopeplis perfoliata*, *Salsola forskalii*, *Anabasis ehrenbergii*, *Euphorbia cuneata*, *Tricholæna leucantha*. On the northern coast of Somaliland only and in South-Arabia the following plants occur :—*Cleome brachystyla*, *Gypsophila montana*, *Jatropha spinosa*, *Euphorbia systyla*, *Crotalaria leptocarpa*, *Convolvulus sericophyllus*. Some species are found in Yemen and Hadramaut or in Yemen alone, *viz.*, *Indigofera arabica*, *Sterculia arabica* (also on the island of Socotra), *Cassia adenensis*, *Acacia edgeworthii*, *Corallocarpus glomeruliflorus*, *Ptychotis arabica*, *Pulicaria glutinosa*, *Steinheilia radians*, *Caralluma forskalii*, *Caralluma adenensis*, *Campylanthus junceus*, *Lavandula setifera*, *Salsola bottæ*.

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[1] Cf. Krause, l. c.

The third group shows a wider distribution, containing members of the N. African Steppe-province, which comprises Kordofan, Darfur, Sennaar, Etbai, Abyssinia, Yemen, Hadramaut, Somaliland and the island of Socotra. A good many species reach eastwards as far as Sind and the Punjab.

The subjoined table shows the species with their respective boundaries of distribution :—

Species.	Boundary towards	
	West.	East.
1. Cleome papillosa	Kordofan.	Sind.
2. Cl. brachycarpa	Kordofan.	N.-W. India.
3. Cl. paradoxa	Kordofan.	S.-Arabia.
4. Cadaba rotundifolia	Kordofan.	S.-Arabia.
5. C. glandulosa	Kordofan.	S.-Arabia.
6. C. longifolia	Sennaar.	S.-Arabia.
7. Reseda amblyocarpa	Abyssinia.	S.-Arabia.
8. Melhania denhami	Kordofan.	Sind.
9 Indigofera semitrijuga	Sennaar.	Sind.
10. Tephrosia apollinea	Upper Egypt.	Beluchistan.
11. Taverniera glauca	Abyssinia.	S.-Arabia.
12. Rhynchosia minima	Sennaar.	Sind.
13. Poinciana elata	Nubia.	Sind.
14. Acacia spirocarpa	Kordofan.	S.-Arabia.
15. A. nubica	Nubia.	S.-Arabia.
16. A. mellifera	Kordofan.	Yemen.

Species.	Boundary towards	
	West.	East.
17. Cucumis pustulatus	Abyssinia.	Yemen.
18. Oldenlandia schimperi	Kordofan.	Beluchistan.
19. Vernonia atriplicifolia	Abyssinia.	Yemen.
20. Launaea lactucoides	Abyssinia.	S.-Arabia
21. Lactuca goraensis	Kordofan.	Yemen.
22. Convolvulus glomeratus	Abyssinia.	Punjab.
23. Anticharis glandulosa	Nubia.	Sind.
24. Ruellia patula	Abyssinia.	Rajputana.
25. Buchea marrubiifolia	Kordofan.	Sind.
26. B. pterygocarpa	Kordofan.	Yemen.
27. Orthosiphon pallidus	Nubia.	Punjab.
28 Euphorbia arabica	Nubia.	Yemen.
29. E. schimperi	Nubia.	S.-Arabia.
30. E. polycnemoides	Kordofan	Yemen.
31. Forskohlea viridis	Abyssinia.	S.-Arabia.
32. Paspalum pennatum	Abyssinia.	Sind.
33. Eragrostis mucronata	?	Ceylon.

More than ⅓ of the flora of Aden is identical with plants of the Indo-African desert. About half this number is spread over the whole region, whilst the rest is confined to a smaller area. It is, of course, impossible to draw accurate lines between the desert and the steppe-region. The transition from one botanical area to another is never a sudden one, and the same species may be common to both regions. Thus, we might have included under the foregoing groups some plants which now we are going to give in the following as being characteristic of the desert-flora :—

Species.	Boundary towards	
	West.	East.
1. Cocculus leaeba	Cape Verd Islands	Gujarat.
2. Diplotaxis pendula	Morocco	South-Persia.
3. Dipterygium glaucum	Kordofan	Punjab.
4. Maerua crassifolia	Senegambia	Arabia.
5. Cadaba farinosa	Senegambia	Arabia.
6. Capparis galeata	Egypt	Sind.

Species.	Boundary towards	
	West.	East.
7. C. decidua	Darfur	Punjab.
8. Polygala erioptera	Cape Verd	Bengal.
9. Polycarpæa spicata	Egypt	Sind.
10. P fragilis	Senegambia	Sind.
11. Grewia populifolia	Senegambia	Ceylon.
12. Corchorus antichorus	Cape Verd Islands	Deccan.
13. C. trilocularis	Senegambia	Sind.
14. Cometes abyssinica	Egypt	Arabia.
15. Zygophyllum simplex	Cape Verd	Sind.
16. Fagonia parviflora	Upper Egypt	Arabia.
17. Farsetia longisiliqua	Upper Egypt	Arabia.
18. Balsamodendron opobalsamum	Nubia	Arabia.
19. Zizyphus spina Christi	Senegambia	Punjab.
20. Z. lotus	Morocco	Arabia.
21. Moringa aptera	Upper Egypt	Arabia.
22. Crotalaria lupinoides	Kordofan	Arabia.
23. Indigofera parvula	Nubia	S.-Arabia.
24. T. paucifolia	Senegambia	Java.
25. T. argentea	Kordofan	W.-India.
26. Alhagi maurorum	Egypt	S.-Arabia.
27. Cassia obovata	Senegambia	W.-India.
28. C. holosericea	Nubia	Sind.
29. C. angustifolia	?	?
30. Acacia eburnea	Arabia	Punjab.
31. A. arabica	Senegambia	Ceylon.
32. Cucumis prophetarum	Egypt	Sind.
33. Citrullus colocynthis	Canaries	Punjab.
34. Limeum indicum	Nubia	Punjab.
35. Ipomoea scabra	Egypt	Arabia.
36. Dicoma schimperi	Nubia	Sind.
37. Salvadora persica	Senegambia	Punjab.
38. Glossonema boveanum	Upper Egypt	Arabia.
39. Calotropis procera	Cape Verd	Central India.
40. Echiochilon fruticosum	?	Arabia.
41. Heliotropium zeylanicum	Senegambia	Punjab.
42. H. lignosum	S.-Arabia	S. Persia.
43. Arnebia hispidissima	Kordofan	Punjab.
44. Breweria latifolia	Nubia	Punjab.

Species.	Boundary towards	
	West.	East.
45. Lindenbergia sinaica	Egypt	Arabia.
46. Blepharis edulis	Kordofan	Punjab.
47. Boerhaavia elegans	Nubia	Punjab.
48. B. verticillata	Senegambia	Punjab.
49. Suæda vermiculata	Canaries	Arabia.
50. Traganum nudatum	Algeria	S.-Arabia.
51. Chrozophora obliqua	Kordofan	Punjab.
52 Euphorbia granulata var. glabrata	Canaries	Punjab.
53. Forskohlea tenacissima	Canaries	Punjab.
54. Pancratium tortuosum	Nubia	Arabia.
55. P. maximum	Nubia	Arabia.
56 Cyperus effusus	Upper Egypt	Sind.
57. C. conglomeratus	Senegambia	Sind.
58. C. falcatus	Upper Egypt	S.-Arabia.
59. Panicum turgidum	Egypt	Central India.
60. Tricholæna teneriffae	Canaries	Punjab.
61. Andropogon foveolatus	Canaries	Central India
62. Aristida calopatila	Egypt	S.-Persia.
63. A. plumosa	Morocco	W.-Tibet.
64. A. hirtiglume	Tunis	Punjab.
65. Sporobolus spicatus	Do.	Deccan.
66. S. glaucifolius	Do.	Punjab.
67. Pappophorum brachystachyum	Do.	Punjab.
68. Eragrostis cynosuroides	Do.	Sind.
69. Æluropus littoralis	Algeria	Arabia.

To the fifth group belong those species which are distributed over the Old World or which show a still wider distribution. Of the Old World-Flora the following representatives grow in Aden :—*Portulaca quadrifida, Abutilon fruticosum, Hibiscus micranthus, Corchorus olitorius, Tribulus terrestris, Vitis quadrangularis, Trianthema crystallina, Trianthema pentandra, Orygia decumbens, Mollugo cerviana, Launæa nudicaulis, Heliotropium strigosum, Lycium europæum, Ocimum gratissimum, Ærua javanica, Aristlochia bracteata, Phyllanthus maderaspatensis, Pennisetum ciliare, Aristida adscensionis, Eragrostis major, Eleusyne ægyptiaca.* Still wider in their distribution are : *Polycarpæa corymbosa, Fagonia cretica, Ipomæa biloba, Suæda fruticosa, Panicum* *colonum*, *Setaria verticillata*, *Setaria viridis*, *Cynodon dactylon*, *Eragrostis ciliaris.*

It is evident from the above tables that a great number of species is common to Aden and the countries bordering the Red Sea on the opposite side. It is just this similarity of vegetation which induced some scientists to assume an old continent as the centre of origin of this flora. At an early period, they say, this continent must have disappeared, when and in what way we are not told. At the same time, perhaps, or at a later period a great depression of land took place which resulted in the formation of the Red Sea and, consequently, in the separation of Arabia from Abyssinia. Along both shores of the Red Sea and of the Gulf of Aden there is known to be a great development of volcanic rocks. There is every probability that these, so far as they are known, belong to one series; and as some active volcanoes still exist in the sea, and cones quite unchanged in form and evidently of very recent date abound in many places along the coast, it is clear that the series is still in process of formation, and that it is, in part at least, of recent date. Although there can be little doubt of the recent date of a large portion of this series, the great amount of denudation which parts of it have undergone around Zulla and Massowa and also at Aden seem to prove that these portions of the series are of a more ancient date, but not older than the Pliocene rocks. It is, therefore, impossible that the flora of Aden developed independently during a geological period of long duration; we must on the contrary conclude, that it is the product of species imported from the neighbouring countries. This view is strengthened by the fact that the plants endemic in Aden are only very few.

In order to give a more complete aspect of the flora of Aden, I examined the morphological structure of a number of plants, which is apt to give a more adequate insight into the life-functions of a vegetation that has to thrive under such unfavourable conditions as are those of Aden. The account will, naturally, be fragmentary, and I am making an attempt in the hope only that there will be found some who are willing to continue and complete the work.

As scarcity of water is the most prominent feature in the climate of Aden, we shall, in the first place, see what special adaptations there e to be found in the organs of absorption and transpiration.

he rain being very scanty, it is on the whole only after a rainfall he soil of the valleys is uniformly moistened throughout, so that the plants are able to draw the necessary supply of water even from the upper layers of the ground. After a very short time the rain water partly evaporates, partly sinks deeper, and either flows off on the hard inclined rock, or is collected in subterranean reservoirs. It would be interesting to examine and compare the various modifications of roots of the Aden-plants, which must be considered as so many adaptations to the respective conditions of water-supply. But such investigations can be made on the spot only, and it is quite superfluous to speculate upon the use of long and short, thick and thin, vertical and horizontal roots that you may find in a herbarium, if you are not told at the same time where they are growing, at what depth water is to be found at a certain period of growth, whether dew might influence the development of roots at a certain time of the year, etc. The same holds good if we want to know some details about the absorption of moisture and dew by subaërial organs, whether the process consists in the condensation of moisture by the secretion of hygroscopic salts or in the absorption of rain and dew by trichomes. In any case, minute hygrometric observations and careful experiments on the living plant are wanted.

With regard to transpiration we may say beforehand that such abnormal thermometric and hygrometric conditions as prevail at Aden must necessarily lead to excessive evaporation from the plants, and, consequently, to their destruction, if there do not arise special protective modifications in the organs of the plant-body counteracting the adverse influences. There is, besides, another factor, which must not be neglected, *viz.*, the insolation. The vegetation is exposed to its influence almost throughout the whole year, and the edaphic formation of Aden can only increase its intensity. Statistical accounts as to the values of insolation at Aden are, as far as I am able to ascertain, entirely wanting, and still less can we be expected to know to what degree the heat of the soil raises the temperature within the plant. In spite of the deficiencies in our knowledge, an examination of the flora of Aden as to the special contrivances for regulating the water-supply will reveal some interesting facts.

The most efficient protection from too great a loss of water transpiration is obtained by the reduction of the evaporating su The following plants have their leaves reduced in size, and someti also in number:—*Farsetia longisiliqua*, *Cocculus leæba*, *Dipter* *glaucum*, *Cleome papillosa*, *Cl. brachycarpa*, *Cl. paradoxa*,

thomsoni, *Cadaba glandulosa*, *Polygala erioptera*, *Polycarpæa corymbosa*, *Sphærocoma hookeri*, *Corchorus antichorus*, *Grewia populifolia*, *Zygophyllum simplex*, *Balsamodendron opobalsamum*, *Moringa aptera*, *Indigofera semitrijuga*, *I. arabica*, *I. paucifolia*, *I. parvula*, *Taverniera glauca*, *Rhynchosia minima*, var. *memnonia*, *Oldenlandia schimperi*, *Heliotropium strigosum*, *Convolvulus glomeratus*, *Linaria macilenta*, *Schweinfurthia pterosperma*, *Campylanthus junceus*, *Lavandula setifera*, *Saltia papposa*, *Suæda fruticosa*, *S. vermiculata*, *Euphorbia arabica*, *E. cuneata*, *E. systyla*, *Ephedra foliata*, var. *ciliata*. The aridity of the climate has also favoured the production of spines and spinous structures. Of the many species which show these modifications I need only mention: *Capparis galeata*, *Fagonia cretica*, *Zizyphus lotus*, *Zizyphus spina Christi*, *Sphærocoma hookeri*, *Acacia edgeworthii*, *A. eburnea*, *A. hamulosa*, *Acacia spirocarpa*, *A. nubica*, *Lycium europæum*, *Blepharis edulis*, *Jatropha spinosa*, *Alhagi maurorum*.

In *Cocculus leæba* we observe that the bigger leaves fall off very soon, whilst a few of the smaller ones remain. The former are characterized not only by their greater size, but also by their anatomical structure. They are usually thinner, more pointed, and entirely devoid of hairs. The stomata are almost superficial and equally distributed over both surfaces. The remaining leaves on the other hand are covered with thin-walled hairs which, even when the leaf is dry, absorb water very easily.

Another kind of reduction of the evaporating surface is shown in leaves which are rolled up lengthwise or have become cylindrical, as *e. g.* in *Zygophyllum simplex*, *Eragrostis mucronata*, *E. cynosuroides*, *Sporobolus spicatus*, *Æluropus villosus*, *Aristida adscensionis*, *A. plumosa*, *A. hirtigluma*. In too bright and intense illumination the leaflets of *Cassia obovata* change their transverse position more or less in a line with the direction of the rays of light. By assuming this perpendicular position the upper sides of each pair of pinnæ cover each other and thus reduce the transpiring surface by one-half; besides, in this case, only the margins of the leaflets are exposed to the rays of the sun.

Many of the Aden plants have greyish-white stems and leaves. This colour is due to a very thin layer of wax which covers all the green parts of the plants, thus protecting the tissues against too profuse transpiration; I mention here only *Capparis spinosa*, in which the cholorophyll of the leaves is shining faintly through the covering of wax. In other plants, v. g. in *Cocculus leaeba*, a thick mantle of cork surrounds stem and branches, whilst *Panicum turgidum*, *Sporobolus spicatus* and other species show strongly cuticularized epidermis which diminishes transpiration from the outer surface. The same effect is obtained in some plants by the deposition of a mucilaginous substance in the epidermal cells, v. g. in *Zizyphus spina Christi*. *Moringa aptera*, and *Cassia obovata*.

NOTES ON A TRIP AFTER THE *OVIS POLI*.

BY

COLONEL G. D. F. SULIVAN, LATE 4TH D. G.

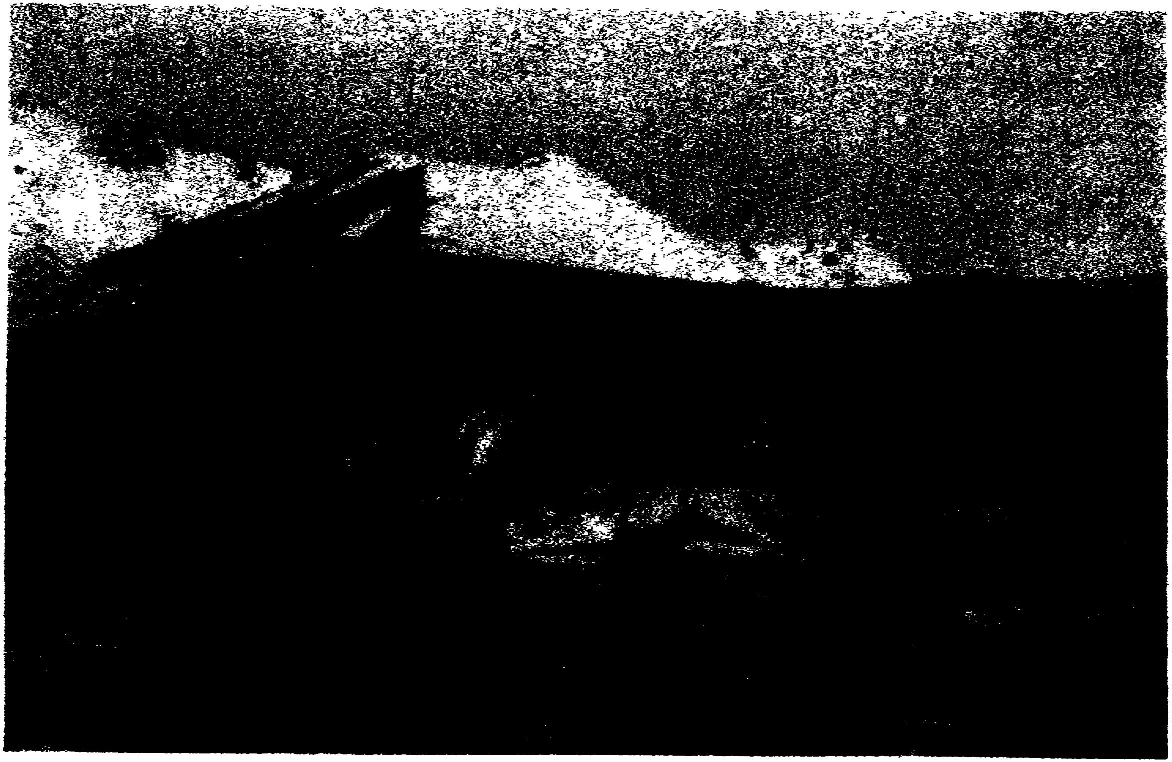
It is only within recent years, comparatively speaking, that the *Ovis poli*, the most magnificent of all the wild-sheep tribe, has been shot by Indian sportsmen, but now every spring sees a few of the latter start on the long and dreary trêk to the Taghdumbash Pamir, *via* Gilgit, the only country available for this sheep, now that the Russian Pamir is closed to all foreigners, as was ordered some few years ago, and has since been rigidly enforced. A Chinese passport is necessary for this Pamir, in addition to a permit from the Indian Government to proceed by the Gilgit route, and only a very limited number of the latter are granted each year, but the former is easily obtained, and a Britisher may always feel sure of a welcome from the Chinese officials and from the natives of the country. It had long been my ambition to add a good pair of Poli horns to my collection of big-game trophies, but it was not till 1905 that the opportunity occurred for me to try my luck in that direction, and then owing to a bad attack of pleurisy and pneumonia, which had reduced me to a mere wreck, I was very late in making a start. One ought to leave Kashmir by the middle of April at latest, for though one may have considerable trouble at the Tragbal and Burzil Passes, when once over them, it is plain sailing to Hunza, which country one ought to reach early in May, before the snow begins to melt and so flood the rivers, when the usual track up their beds is impracticable, and one has to go by an upper one, which is a terror in many places, besides making the marches much longer.

Before proceeding further, it may be as well to allude here to the servants I took with me, and to the arrangements necessary to make before starting on this trip. As regards the former, I took a cook, one coolie, and my shikari, Rahima of Bandipur, who valeted me and waited at table in addition to his legitimate duties, and did right well throughout the trip: he could also speak the Kirghiz language to a certain extent, but not being aware of this fact, I took on a man from Baltit as interpreter, who was really quite unnecessary. I took supplies with me to last to Gilgit, and Major Hennessy, S. and T. Corps, Bandipur, kindly gave me authority to draw on the Commissariat Depôt there for what I wanted in the way of flour, rice, etc., which was of the greatest assistance to me, as one cannot indent on the country beyond Hunza for anything except an occasional sheep, and fowl. Having settled on my date of departure, in compliance with his request, I advised the Political Agent, Gilgit, of the probable date of my arrival there, to enable him to make arrangements for my further progress, and on May 21st I weighed anchor at Srinagar to drop down the river in my boats to Bandipur, accompanied by my faithful Norwegian elk-hound Stöob, well known in the Happy Valley, and a favourite with every one, but especially so with his master.

The road from there to Gilgit is too well known to need description, and the 13 marches are given in the various guide-books, while the difficulties of the road vary every year according to the snowfall of the previous winter, as to whether it has been an early or late one, the latter being bad. When nearing Gilgit, I was met by an orderly with an invitation from Major Gurdon, C.I.E., D.S.O., Political Agent, to put up with him, which I gladly availed myself of, and I stayed there a day and then was lucky enough to have his company as far as Baltit, since he was going to Nagar on duty and asked me to go with him, as it was only a short distance out of my way and he would then go on to Baltit with me, and see me start. From Gilgit to Baltit by the direct road is 4 marches, a capital bridle-path all the way, but on from the latter place, where I parted from my hospitable host on June 17th, the upper track, which I had to take owing to the rivers being in heavy flood, is an execrable one for most of the 7 marches to Murkhushi, the last camp on the south side of the Passes leading to the Pamir. The arrangements Major Gurdon had made for my march up were most excellent, and there was no hitch anywhere, coolies, etc., always ready, and at Murkhushi I found yâk waiting for me, under the charge of a capital man, Dowut by name, and, as I found out afterwards, quite a swell in his way. Although the altitude of Murkhushi is close on 12,000 feet, there is a small forest of willow trees there, and as dead wood abounded, I indulged in a roaring camp-fire, quite an unwonted luxury, for fuel is scarce after Baltit.

There are 2 passes from Murkhushi, the Killik and the Mintaka, and Dowut recommended my going by the latter, the most easterly, there being less snow on it, and we crossed without much difficulty, though it was a rough climb for the yâk over huge boulders of rock, and on the 25th June I reached the Pamir, camping at Mintaka Agbaz. Dowut had a large Kirghiz tent ready for me, nicely carpeted, and actually furnished with bentwood chairs, and having ridden ahead when we had got within sight of his encampment, he was ready to receive me on my arrival, and solemnly shaking me by the hand, as if he had not already seen me, led my yâk up to the doorway of the tent, and ushered me in with much ceremony. A Kirghiz shikari, Begonde, who had been ordered for me, arrived next day, and recommended my first trying the Kuktaruk nullah, the extreme west of the Taghdumbash, and I settled to do so, and showed him a Poli head that Dowut had in his care, which had been shot by a sportsman a short time previously, and told him I did not want to shoot any smaller than that, and he scouted the idea of his ever wishing me to do such a thing. The horns were massive, and just about 60 inches in length, as far as I could judge, sewn up in skin as they were, and that was the measurement I had fixed on beforehand as the lowest limit of a shootable head, so took the opportunity of showing Begonde what I wanted. It was 2 marches to the Kuktaruk, and on the way we saw numerous Poli heads, and whenever we came across what looked a good pair of horns, Rahima and I dismounted, and ran the tape over them, and then set the head up on a rock, looking the way we were going, so as to study the horns from a distance through the glasses, and we soon felt very confident about our being able to judge the head of a live ram. The valley we marched up was alive with marmots, and Stöob had great sport after them, the fact of his not meeting with any success as regards catching any not seeming to damp his ardour at all, either for chasing them or for trying to dig them out when they had got safely down their burrows. On June 29th, Rahima, Begonde, a local Kirghiz, and I started off in the dark up the Kuktaruk, each of us riding a yâk, and just at daybreak the Kirghiz spotted some Poli, and quickly dismounting, we left our yâk and crawled up to within 150 yards of the sheep and soon had the glasses on them. The band consisted of 16 rams, and Rahima and I both put the biggest at 55, but the Kirghiz declared that several were over 60, which was absurd, for the best pair of horns only grew outwards for about a couple of inches after completing the circle, while instead of coming close into the jaws, they were very wide of them, which is nearly always the case in an immature head, so I absolutely refused to take a shot. As these were the first Poli I had ever seen, I lay and watched them for some time through the telescope, glad of the opportunity to study their make, and shape. The rams of this grand sheep are rather long in the leg, standing about 11½ to 12 hands at the shoulder, and are of light, graceful build, more like an antelope, to my mind, than any other species of wild sheep is, and huge though the horns are, they do not make the heads look top-heavy. In colour the rams are of a mouse grey on the body, dark on the back and lighter on the side and neck, while the head, legs, belly, and inside the thighs are almost white. The horns, with well developed transverse wrinklings, after forming a circle, make a bold sweep outwards, which is the great characteristic of the head of this species of wild sheep, and the weight of a big pair is so enormous that one wonders how such a slender neck can carry them so easily, for I have never seen a Poli lying with his head on the ground, as one so frequently does big buck ibex, and markhor, as if they felt the weight of their horns.

Having studied them to my heart's content we crawled away, and rode on to look for another lot, finding 5 more during the day, and by the time we reached camp we had seen well over 100 rams, the best of which was 56 to 57. Each time Begonde had tried to get me to shoot one, getting very sulky at last at my continual refusal, and declaring that we should never find better ones, and that I had let off several splendid heads, all over 60. It was the same story every day and at last he began to get on my nerves to such an extent, that I told Rahima I felt sure I should lose my temper one day, and should shoot one of Begonde's big rams, just to prove to him that we were right and he wrong about the heads, and it came off even sooner than I expected. We started off in the dark one bitterly cold morning, when my temper was much like that of the proverbial bear with a sore head, and just after daybreak came on a band of rams, when the light was still bad, so we dismounted and went on to get a near view of them. They were slowly working their way up hill, led by a ram, which Begonde at once declared had a grand head and said to Rahima "What is the good of my showing the Sahib big heads, when he will not shoot at any of them"? Rahima passed this remark on and it was too much for me, as I could see with the naked eye it was not a big head, but my temper was up, so I took the rifle, and though Rahima who had got his glasses out by then, called out "Do not shoot, Sahib, it is only about 50." I fired, as I meant having that ram if I could, and of course, as it really was a small one, dropped it, and told Begonde to go and look at his big head. He did not come back, so we joined him and found him contemplating, with a very crestfallen face, a



J. Green, Photo imp.

THE GREAT PAMIR SHEEP. (Ovis poli).

Photo by Col. G. Sulivan

massive head of just 50, which would have been a grand pair of horns in another 6 or 7 years. I let my tongue rip at him then, but Rahima had to pass my abuse on to him, and unfortunately could do very scant justice to my perfect tornado of curses, owing to his imperfect knowledge of the language, but he did his best? It weighed on my mind at first having shot this ram in a fit of temper, but that soon wore off when I found what an effect my outburst at Begonde had on him, and the other Kirghiz, for they would show me rams of even 58 without attempting to get me to fire at them, merely saying "not good enough for the Sahib", and word was passed on ahead, so I had no more bother even with fresh shikaris. It was some days before we found a good ram, but he really was a good one, Rahima putting his horns at over 64, and I am sure they were all that, and very massive too, in fact this was the best ram I saw on the whole trip. Begonde had left me, having been sent for by .the Amban at Tashkurgham, so I got another local man in his place, and we found a band of rams in the morning, but they were high up the mountain-side, from where they commanded the whole plain, so we returned to camp, going out again in the afternoon to look for them. We were riding slowly along the lower slopes, and had just begun to descend into a deep nullah, when Rahima, who was leading, suddenly threw himself off his yak, so I followed suit and then saw the rams only some 50C yards above us, coming down the opposite side of the nullah. The Kirghiz were very slow in grasping the situation, but did so at last, and we led our yak back over the ridge, and leaving them in a hollow, hurried back to the crest, but the rams had moved down very quickly, and were far below us, feeding on the plain. We could not move till they had fed behind a rocky ridge some 400 yards ahead of us, which we raced for as the last animal was disappearing, and the Kirghiz carrying the rifle outpaced me, reaching the ridge some way ahead, and then, to my horror, raised himself up to have a look over a boulder of rock. I saw what he was going to do, and knew what the result would be, but was too far off to stop him, and the next instant heard a hissing whistle and the sheep were streaming away along the plain and then turned up to the mountain side. It was a grand opportunity thrown away, for the rams were well within 100 yards of the ridge, and the wind dead in our favour. Having reached safety, the rams kept turning round, and looking down in our direction as they slowly ascended the mountain, and the big ram's head seemed to me to grow bigger and bigger the higher he went, till it looked simply magnificent as he stood on the skyline, and turned round for a final gaze, and one could see the long curl to his horns. I was too sick at heart even to swear, and simply started off home, but Rahima made up for my silence by cursing the Kirghiz the whole way back, and the last sound I was conscious of that night, when curled up in my blankets, was his voice still at him! For a whole week I hunted for that ram, moving camp to several neighbouring nullahs, but we never set eyes on him again, and the band must have crossed either the Russian or Afghan Frontier, both being quite close. My bad luck continued, for on our at last finding another good one, which we put at just over 60, I made a clean miss after a desperate long stalk of nearly 5 hours on foot, which so tired me, that I do not think I could have hit a hay rick, and it was a long shot of nearly 200 yards. Having now tried all the nullahs to the west, "Where Three Empires Meet" we settled to move to the east, and made for the Peyik, said to be a good place for a big ram, as it touches the Russian frontier, and the best rams are said to be on their ground. Having reached our nullah, we started off up it on July 19th in the dark, and just at the first glimmer of day-light we rode right on to 3 rams, which at once galloped off, and the light was so bad we could not see what their heads were, but Rahima said he thought one was good. We followed slowly and then saw a band of 15, so got the telescope out, when the Kirghiz, a new man, said the best was just too small for me, but that it was very close on 60, and suggested our going on to look for the three rams again. I was very pleased at the way he discarded this ram, for Rahima said he thought it was just up to our lowest limit, but we went on, and then saw our 3 rams some miles ahead, just as they were going into a small nullah running down from the Russian boundary, and though Rahima only just got the telescope on them as they were disappearing, he said that he was sure one was well over 60, so we settled to stay there for the day, on the chance of their coming back in the afternoon, though it seemed rather a forlorn hope, as we had scared them badly. I was sound asleep when Rahima came to me at 3 p.m. with the welcome news that the three rams had appeared, and he said he had had a good look at them and that the best was certainly over 62, and the others just about 60. It was an ideal ground for a stalk, and after an hour's hard going with a certain amount of crawling towards the end, we got up to our game, and taking my trusty ·308 I crawled to the top of a mound with the Kirghiz, and then saw two of the rams some 80 yards off, but could see nothing of the third one. The Kirghiz said something, which of course I could not understand a word of, and signed to me to take the right hand one, but whether he meant of the two in front of us, or could see the third one still more to the right, I was not sure, but there was no time to be lost, for the one I fancied he must mean me to take was gazing most intently in our direction, as if already suspicious. It was not a nice shot, though the ram was broadside on, for there was a ridge between us which covered the lower part of its body, and I dared not raise myself any higher, while a wretched flower was wobbling about at the very muzzle of my rifle, which bothered me dreadfully, but, hoping for the best, I slowly pressed the trigger, and the ram dropped out of sight at once, so I knew he was mine. I sprang to my feet and then saw him lying stone-dead, and at the same time Rahima set my mind at ease by calling out "You have got the big one, Sahib," so I started off joyfully to inspect my prize, and long before getting up to it could see it was a real good one. It was a light head measuring 65″ and 14⅜ in girth, the horns being thin but with a wonderful curl to them, the points just beginning to turn upwards again to form a second one, and I never saw another one like it among the many scores of heads I inspected on the Pamir, though finding several larger ones.

The best I saw was a magnificent head of 68, the horns very massive, and I should have brought it away, only that the horns were so weather-worn, and cracked by the sun: this ram had been killed apparently about 2 years previously, and by wild dogs, as the Kirghiz said that if any of them had shot it, the head would have been taken away to sell, being such a fine one. *Apropos* of the great number of skulls one sees everywhere, a sportsman who had shot on the Russian and Chinese Pamirs some 8 years before my visit to the latter, told me, on his arrival in India, that the Poli had been killed off by hundreds by foot-and-mouth or other disease, but after careful enquiries from the Kirghiz I am sure that this was quite an erroneous idea, for one and all assured me they had never known any epidemic among the Poli, or their tame flocks, and accounted for the numerous skulls by saying that they were animals, either that they had shot, or that had been killed by wild dogs in the winter, when the snow is deep and soft. These pests account for great numbers of Poli every year, the Kirghiz told me, and though they shoot every wild dog they get a chance at, as a skin fetches 3 Rupees, the brutes are so cunning that very few are killed in the course of a year. I seldom came across them during my trip, and then only a very few at a time, and was told they leave that Pamir in the early spring, returning on the first heavy fall of snow.

To return to my narrative, that was the last shot I fired with my rifle on the Pamir, though I saw a fine ram with a massive head of over 63, a few days afterwards. It was a bad day, snowing continually and I did not want to go out at all, but the Kirghiz persuaded me to, so I started, but with many misgivings, which proved only too well founded, for on finding the band with this good head in it, and attempting the stalk, they winded us, and at once crossed the frontier, and we never saw them again. I then tried all the nullahs to the east, and south-east to the Khunjerab Pass, but the best I could find were a couple of rams just over 60 and having raised my lowest limit then to 63, I refused to shoot either, much to the disgust of the Kirghiz with me at the time. Not to throw away any chance of getting another good one, I worked my way back to the Kuktaruk, trying all the nullahs *en route* again in hopes of a big ram having crossed over, but we did not find what I considered a shootable head, and I realised the fact that I was done, and on September 4th we left the Pamir, crossing by the Killik Pass, then clear of snow, and easy going.

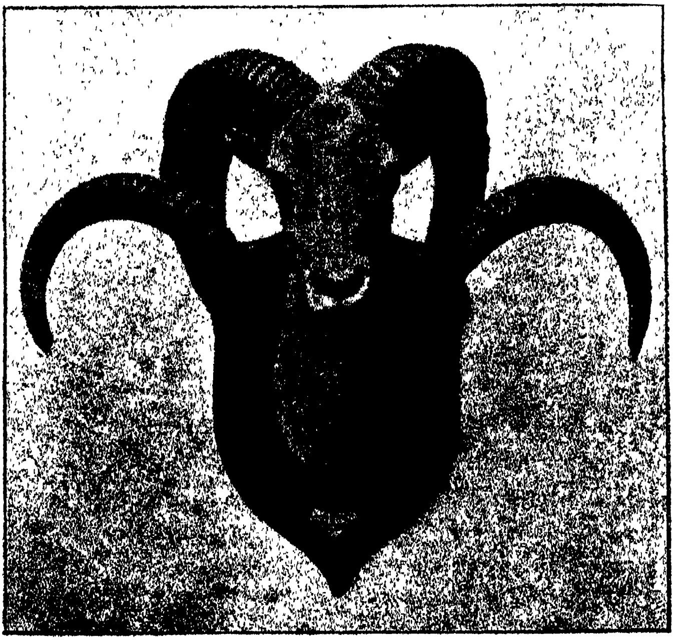
It will be seen by the foregoing notes that, though small rams abound on the Taghdumbash, big ones are very few and far between, and this, I feel convinced, is partly, if not greatly, owing to the indiscriminate slaughter of immature heads, by British sportsmen, that takes place every summer. Whenever I came across a ram of about 58, the Kirghiz with me, while saying he knew it was not big enough for me, used invariably to assure me that any other Sahib would be very pleased with a head of that size, and would shoot all that he could, and no doubt they only said the sad truth. I could forgive a man shooting a head of this sort towards the end of his trip, if he had failed to find a good one, but to go on shooting ram after ram, all with immature heads, is wicked, and those who do it are simply depriving some sportsmen in the near future of the chance of getting trophies worth having, while they take away a number of heads, it is true, but not one that is really typical of a full-grown specimen of this magnificent sheep. Two sportsmen a few years ago shot 11 rams in 8 days, only 2 of which, the Kirghiz who was with them told me, were at all good, a record of slaughter in so short a time probably, but hardly one to be proud of, but some men seem imbued with a regular lust for killing. In hopes of guiding sportsmen in the future into better ways, I append the following:—

Classification of Horns.

Good	... 60 to 64 inches
Very good	over 64 to 68 ,,

and anything over the latter is of course very much of the superlative order: the record is 75, as given in Mr. Rowland Ward's "Record of Big Game." In conclusion, let me beg sportsmen to remember that "quality" comes before "quantity," and that therefore one good head is better than any number of indifferent ones.

Photograph of my
OVIS POLI HEAD.



Shot July 10th, 1905.
Horn measurements. Length 68". Girth 14⅜".
(By Messrs. Rowland Ward.)

ON THE BIRDS OF THE CHINDWIN, UPPER BURMA.

By

Major A. Mears, Survey of India,

and

Eugene W. Oates, F.Z.S.

The birds mentioned in this article were collected in the Upper and Lower Chindwin Districts of Upper Burma during the months of November to May of the years 1902—06. The area in which the main portion of the collection was made, has for its limits on the north the Sittaung-Tammu road to Manipur; on the south the Pakokku-Lower Chindwin District boundary; on the east the Chindwin River and on the west the Kabaw-Kalè-Myittha valleys. The country is very sparsely inhabited and consists chiefly of Government Reserved Forests containing large quantities of teak, pyinkadaw and other valuable timber. The ground is hilly and broken; two main ranges, the Pondaung and Ponyadaung, traverse the area from north to south, averaging about 3,000 feet above sea level and in places running up to over 4,000 feet. Both these ranges and their offshoots are densely wooded in spite of their slopes being often very precipitous and scarped. Many of the ridges, more particularly in the north, are almost razor edges falling abruptly away on both sides, and it is surprising how any vegetation can take root or thrive on their nearly perpendicular slopes. The undergrowth in the valleys is very heavy and dense; thick bamboo and cane jungle, evergreen forest and creepers practically impassable except along game and other paths. Communications in all but the extreme south are far from good; there are one or two fair bridle paths or trade routes leading from the Chindwin into the Kalè-Myittha valleys, but usually the beds of streams serve the purpose of roads. Game is plentiful everywhere: elephant, tiger, panther, and even an occasional rhinoceros are met with. Large numbers of bison, tsine (the wild ox of Burma), sambhar, gee (barking deer), and in the more open parts, on the outskirts of cultivation, thamin (the brow-antlered deer) are to be found.

The climate is cool and pleasant from the middle of December to the end of February when it begins to warm up, and the months of April and May can be unpleasantly hot. Although somewhat feverish the country cannot be said to be unhealthy until the commencement of the rainy season early in June.

I am indebted to Mr. Eugene W. Oates for the following notes on my collection of birds. [A.M.]

The interesting collection of birds brought home by Major Mears contains 224 species, many common birds were not collected and are therefore not included in the following list, otherwise the total number would not be far short of 300.

This list, taken in conjunction with Mr. K. C. Macdonald's List of the Birds of the Myingyan District, published recently in the Society's Journal, gives a very good idea of the ornithology of Upper Burma.

The localities where the specimens were collected have been noted by Major Mears on the labels. Many of these, however, are not shewn on any published map of Upper Burma and it has therefore been considered unnecessary to record them. Many of the species are, moreover, of very wide distribution, and there is every reason to think that they occur over the entire area in suitable localities. When species are local or somewhat rare, those localities where they were obtained are given when they are to be found on the Survey of India Map of Upper Burma on the scale of 16 miles to the inch.

Six of the species noted in the following list have been recorded from the Indian Empire since the bird volumes of the "Fauna of British India" were published. To these a number cannot be given. With this exception, all the species are referred to by the number and name used in the volumes of the "Fauna." [E. W. O.]

12. Urocissa occipitalis.—The Red-billed Blue Magpie.

14. Cissa chinensis.—The Green Magpie.

16. Dendrocitta rufa.—The Indian Tree-pie.

22. Crypsirhina cucullata.—The Hooded Racket-tailed Magpie.

Mingin, Upper Chindwin, and other localities south of this place.

— Garrulus oatesi.—The Indo-Chinese Jay.

Sharpe, Bull. B. O. C. V., p. xliv (1896). Both in the Upper and Lower Chindwin.

31. Parus atriceps.—The Indian Grey Tit,

69. Garrulax leucolophus.—The Himalayan White-crested Laughing-Thrush.

72. Garrulax pectoralis.—The Black-gorgeted Laughing-Thrush.

With the tips of the tail-feathers white.

73. Garrulax moniliger.—The Necklaced Laughing-Thrush.

With the tips of the tail-feathers white.

106. Argya gularis.—The White-throated Babbler.

Universally distributed as far north as Kani.

— Pomatorhinus mearsi.—Mears's Scimitar Babbler.

Ogilvie-Grant, Bull. B. O. C. xv., p. 39 (1905).

A local race of *P. schisticeps.*—The general colour above is much paler. The crown is ashy brown, not slate-colour, and the rufous stripe down the side of the neck is pale chestnut red, not deep chestnut maroon.

Specimens were procured in the Upper Chindwin; also at Myittha.

131. Pomatorhinus hypoleucus.—The Arrakan Scimitar Babbler.

Upper Chindwin.

134. Timelia pileata.—The Red-capped Babbler.

143. Pellorneum minus.—Sharpe's Spotted Babbler.

Appears to be found over the whole tract.

165. Alcippe phayrii.—The Burmese Babbler.

Appears to be very common over the whole tract.

169. Stachyrhis nigriceps.—The Black-throated Babbler.

176. Mixornis rubricapillus.—The Yellow-breasted Babbler.

187. Myiophoneus temmincki.—The Himalayan Whistling-Thrush.

230. Zosterops siamensis.—The Siamese White-eye.

Two specimens from Kani.

243. Ægithina tiphia.—The Common Iora.

247. Chloropsis aurifrons.—The Gold-fronted Chloropsis.

249. Chloropsis hardwickii.—The Orange-bellied Chloropsis.

One specimen from the Lower Chindwin.

250. Chloropsis chlorocephala.—The Burmese Chloropsis.

254. Irena puella.—The Fairy Blue-bird.

Procured at Yu-wa and Kani.

263. Criniger flaveolus.—The White-throated Bulbul.

Extending south to about the latitude of Kani.

269. Hypsipetes psaroides.—The Himalayan Black Bulbul.

Appears to be fairly common in the Upper Chindwin.

272. Hemixus flavala.—The Brown-eared Bulbul.

One specimen from the Lower Chindwin.

279. Molpastes burmanicus.—The Burmese Red-vented Bulbul.

General in the Lower Chindwin.

288. Otocompsa emeria.—The Bengal Red-whiskered Bulbul.

290. Otocompsa flaviventris.—The Black-crested Yellow Bulbul.

296. Iole virescens.—The Olive Bulbul.

306. Pycnonotus blanfordi.—Blanford's Bulbul.

Occurs over the whole tract.

317. Sitta neglecta.—The Burmese Nuthatch.

Common over the whole trac

325. Sitta frontalis.—The Velvet-fronted Blue Nuthatch.

333. Dicrurus cineraceus.—The Grey Drongo.

335. Chibia hottentotta.—The Hair-crested Drongo.

339. Bhringa remifer.—The Lesser Racket-tailed Drongo.

340. Dissemurus paradiseus.—The Larger Racket-tailed Drongo.

374. Orthotomus sutorius.—The Indian Tailor-bird.

382. Franklinia gracilis.—Franklin's Wren-Warbler.

389. Megalurus palustris.—The Striated Marsh-Warbler. Occurs at Mingin.

408. Phylloscopus indicus.—The Olivaceous Willow-Warbler. Two specimens from the Lower Chindwin.

410. Phylloscopus fuscatus.—The Dusky Willow-Warbler.

417. Phylloscopus superciliosus.—The Crowned Willow-Warbler.

423. Acanthopneuste lugubris.—The Dull-green Willow-Warbler.

440. Abrornis superciliaris.—The Yellow-bellied Flycatcher-Warbler.

458. Suya criniger.—The Brown Hill-Warbler. Two specimens from Kani.

474. Lanius colluroides.—The Burmese Shrike. Common over the whole tract.

481. Lanius cristatus.—The Brown Shrike.

485. Hemipus capitalis.—The Brown-backed Pied Shrike. Common over the whole tract.

486. Tephrodornis pelvicus.—The Nepal Wood-Shrike.

488. Tephrodornis pondicerianus.—The Common Wood-Shrike.

491. Pericrocotus fraterculus.—The Burmese Scarlet Minivet. Appears to be found over the whole tract.

499. Pericrocotus roseus.—The Rosy Minivet. Procured at Kani and Aingma.

500. Pericrocotus peregrinus.—The Small Minivet.

502. Pericrocotus albifrons.—Jerdon's Minivet. Procured at several localities in the Lower Chindwin.

506. Campophaga melanoptera.—The Pale-grey Cuckoo-Shrike. Occurs from Mingin south through the tract.

510. Graucalus macii.—The Large Cuckoo-Shrike.

512. Artamus fuscus.—The Ashy Swallow-Shrike.

515. Oriolus tenuirostris.—The Burmese Black-naped Oriole.

521. Oriolus melanocephalus.—The Indian Black-headed Oriole.

522. Oriolus traillii.—The Maroon Oriole. From both the Upper and the Lower Chindwin.

524. Eulabes intermedia.—The Indian Grackle.

538. Sturnia malabarica.—The Grey-headed Myna.

539. Sturnia nemoricola.—The White-winged Myna. Appears to be fairly common throughout the tract.

546. Graculipica nigricollis.—The Black-necked Myna.

Specimens from Kani and other parts of the Lower Chindwin.

547. Graculipica burmanica.—Jerdon's Myna.

Numerous specimens ; extending north to Mingin.

549. Acridotheres tristis.—The Common Myna.

553. Æthiopsar grandis.—The Siamese Myna.

Occurs in the Lower Chindwin.

556. Sturnopastor superciliaris.—The Burmese Pied Myna.

Occurs as far north as Mingin.

562. Siphia albicilla.—The Eastern Red-breasted Flycatcher.

Specimens from Kani.

575. Cyornis rubeculoides.—The Blue-throated Flycatcher.

579. Stoparola melanops.—The Verditer Flycatcher.

592. Culicicapa ceylonensis.—The Grey-headed Flycatcher.

594. Niltava sundara.—The Rufous-bellied Niltava.

One specimen from the Upper, and another from the Lower Chindwin.

599. Terpsiphone affinis.—The Burmese Paradise Flycatcher.

Common throughout the tract.

601. Hypothymis azurea.—The Indian Black-naped Flycatcher.

604. Rhipidura albifrontata.—The White-browed Fantail Flycatcher.

One specimen only from Kani.

605. Rhipidura albicollis.—The White-throated Fantail Flycatcher.

608. Pratincola caprata.—The Common Pied Bush-Chat.

610. Pratincola maura.—The Indian Bush-Chat.

615. Oreicola ferrea.—The Dark-grey Bush-Chat.

633. Henicurus immaculatus.—The Black-backed Forktail.

Found both in the Upper and Lower Chindwin.

638. Chimarrhornis leucocephalus.—The White-capped Redstart.

One specimen from the Upper Chindwin.

641. Ruticilla aurorea.—The Daurian Redstart.

Three specimens from the Lower Chindwin.

644. Ruticilla rufiventris.—The Indian Redstart.

A single specimen from Tantabin, Lower Chindwin.

650. Calliope camtschatkensis.—The Common Ruby-throat.

One specimen from Kani.

663. Copsychus saularis.—The Magpie Robin.

664. Cittocincla macrura.—The Shama.

677. Merula atrigularis.—The Black-throated Ouzel.

A single specimen from the Lower Chindwin.

686. Geocichla citrina.—The Orange-headed Ground-Thrush.

693. Petrophila cyanus.—The Western Blue Rock-Thrush.

698. Oreocincla dauma.—The Small-billed Mountain-Thrush.

721. Ploceus megarhynchus.—The Burmese or Eastern Baya.

Under this name in the 'Fauna of India' are included two species, the

Baya from the Himalayas, which Hume names *P. megarhynchus* and the Eastern or Burmese Baya, which should be known by Blyth's name *P. baya*.

723. PLOCEUS MANYAR.—The Striated Weaver-bird.

726. MUNIA ATRICAPILLA.—The Chestnut-bellied Munia.

727. UROLONCHA ACUTICAUDA.—Hodgson's Munia.

735. UROLONCHA PUNCTULATA.—The Spotted Munia.

739. SPORÆGINTHUS FLAVIDIVENTRIS.—The Burmese Red Munia.

From the neighbourhood of Monywa.

781.—PASSER FLAVEOLUS.—The Pegu House-Sparrow.

Specimens from the Lower Chindwin.

797. EMBERIZA AUREOLA.—The Yellow-brested Bunting.

801. EMBERIZA RUTILA.—The Chestnut Bunting.

General throughout the tract.

807. CHELIDON NEPALENSIS.—Hodgson's Martin.

One specimen only from the Upper Chindwin.

814. HIRUNDO GUTTURALIS.—The Eastern Swallow.

827. MOTACILLA LEUCOPSIS.—The White-faced Wagtail.

832. MOTACILLA MELANOPE.—The Gray Wagtail.

833. MOTACILLA BOREALIS.—The Grey-headed Wagtail.

834. MOTACILLA FLAVA.—The Blue-headed Wagtail.

— MOTACILLA TAIVANA.—The Chinese Blue-headed Wagtail.

Two specimens from Monywa. This species may be recognized by its bright yellow supercilium. I believe that this is the first time this species has been recorded from the Indian Empire.

837. MOTACILLA CITREOLA.—The Yellow-headed Wagtail.

A single specimen shot on the 9th April in the Lower Chindwin in full summer plumage.

839. LIMONIDROMUS INDICUS.—The Forest-Wagtail.

841. ANTHUS MACULATUS.—The Indian Tree-Pipit.

846. ANTHUS STRIOLATUS.—Blyth's Pipit.

847. ANTHUS RUFULUS.—The Indian Pipit.

866. ALAUDULA RAYTAL.—The Ganges Sand-Lark.

Two specimens from Kani.

873. MIRAFRA MICROPTERA.—The Burmese Bush-Lark.

From the Lower Chindwin.

882. ÆTHOPYGA SEHERIÆ.—The Himalayan Yellow-backed Sun-bird.

Appears to be common in the Lower Chindwin.

883. ÆTHOPYGA ANDERSONI.—Anderson's Yellow-backed Sun-bird.

One specimen from Mingin.

895. ARACHNECHTHRA ASIATICA.—The Purple Sun-bird.

906. ARACHNOTHERA MAGNA.—The Larger Streaked Spider-hunter.

Occurs over the whole tract.

911. CHALCOPARIA PHŒNICOTIS.—The Ruby-Cheek.

Several specimens from Kani.

912. DICÆUM CRUENTATUM.—The Scarlet-backed Flower-pecker.

914. DICÆUM CHRYSORRHŒUM.—The Yellow-vented Flower-pecker.

927. PITTA NEPALENSIS.—The Blue-naped Pitta.

From Mingin and neighbourhood.

935. PITTA CUCULLATA.—The Green-breasted Pitta.

One specimen from Kani.

944. PSARISOMUS DALHOUSIÆ.—The Long-tailed Broadbill.

Two specimens from Pya.

948. GECINUS STRIOLATUS.—The Little Scaly-bellied Green Woodpecker.

General over the tract.

950. GECINUS OCCIPITALIS.—The Black-naped Green Woodpecker.

951. GECINUS CHLOROLOPHUS.—The Small Himalayan Yellow-naped Woodpecker.

955. CHRYSOPHLEGMA FLAVINUCHA.—The Large Yellow-naped Woodpecker.

958. GECINULUS GRANTIA.—The Northern Pale-headed Woodpecker.

Both from the Upper and Lower Chindwin.

972. LIOPICUS MAHRATTENSIS.—The Yellow-fronted Pied Woodpecker.

From Mingin, Kani and further south.

975. IYNGIPICUS CANICAPILLUS.—The Burmese Pigmy Woodpecker.

General throughout the tract.

983. MICROPTERNUS PHÆOCEPS.—The Northern Rufous Woodpecker.

988. TIGA JAVANENSIS.—The Common Golden-backed Three-toed Woodpecker.

992. CHRYSOCOLAPTES GUTTICRISTATUS.—Tickell's Golden-backed Woodpecker.

As pointed out by Mr. Ogilvie-Grant, this species and the preceding are very similar to each other in plumage.

996. HEMILOPHUS PULVERULENTUS.—The Great Slaty Woodpecker.

Apparently found throughout the tract.

998. THRIPONAX FEDDENI.—The Burmese Great Black Woodpecker.

General. Two birds with the red cheek-stripe were sexed as females by Major Mears. The question whether the sexes of this species are alike or differ in respect of the red cheek-stripe, therefore, should be further investigated.

1002. SASIA OCHRACEA.—The Rufous Piculet.

The Lower Chindwin.

1003. IYNX TORQUILLA.—The Common Wryneck.

Procured at Mingin.

1009. THEREICERYX LINEATUS.—The Lineated Barbet.

1012. CYANOPS ASIATICA.—The Blue-throated Barbet.

1016. CYANOPS CYANOTIS.—The Blue-eared Barbet.

1019. XANTHOLÆMA HÆMATOCEPHALA.—The Crimson-breasted Barbet.

1023. CORACIAS AFFINIS.—The Burmese Roller.

1025. EURYSTOMUS ORIENTALIS.—The Broad-billed Roller.

1026. Merops viridis.—The Common Indian Bee-eater.

1027. Merops philippinus.—The Blue-tailed Bee-eater.

1030. Melittophagus swinhoii.—The Chestnut-headed Bee-eater.

1031. Nyctiornis athertoni.—The Blue-bearded Bee-eater.

Obtained at Mingin.

1033. Ceryle varia.—The Indian Pied Kingfisher.

1035. Alcedo ispida.—The Common Kingfisher.

1043. Pelargopsis gurial.—The Brown-headed Stork-billed Kingfisher.

1044. Halcyon smyrnensis.—The White-breasted Kingfisher.

1045. Halcyon pileata.—The Black-capped Kingfisher.

Appears to be found over the whole tract.

1046. Callialcyon lilacina.—The Ruddy Kingfisher.

One specimen from the Lower Chindwin.

1051. Dichoceros bicornis.—The Great Hornbill.

1053. Anthracoceros albirostris.—The Indo-Burmese Pied Hornbill.

1067. Upupa indica.—The Indian Hoopoe.

1086. Macropteryx coronata.—The Indian Crested Swift.

1090. Caprimulgus monticola.—Franklin's Nightjar.

1093. Caprimulgus macrurus.—Horsfield's Nightjar.

1101. Harpactes erythrocephalus.—The Red-headed Trogon.

Common over the whole tract.

1107. Cuculus micropterus.—The Indian Cuckoo.

1108. Hierococcyx sparverioides.—The Large Hawk-Cuckoo.

These two Cuckoos were obtained in the Upper Chindwin.

1113. Cacomantis merulinus.—The Rufous-bellied Cuckoo.

Appears to be common over the whole tract.

1114. Penthoceryx sonnerati.—The Banded Bay Cuckoo.

1117. Surniculus lugubris.—The Drongo Cuckoo.

1119. Coccystes coromandus.—The Red-winged Crested Cuckoo.

1120. Eudynamis honorata.—The Indian Koel.

1123. Rhopodytes tristis.—The Large Green-billed Malkoha.

1130. Centropus sinensis.—The Common Crow Pheasant.

1133. Centropus bengalensis.—The Lesser Coucal.

1136. Palæornis indoburmanicus.—The Large Burmese Paroquet.

1138. Palæornis torquatus.—The Rose-ringed Paroquet.

1140. Palæornis rosa.—The Eastern Blossom-headed Paroquet.

1142. Palæornis finschi.—The Burmese Slaty-headed Paroquet.

Appears to be common over the whole tract.

1145. Palæornis fasciatus.—The Red-breasted Paroquet.

1150. Loriculus vernalis.—The Indian Loriquet.

1164. Ketupa zeylonensis.—The Brown Fish-Owl.

1178. Scops bakkamœna.—The Collared Scops Owl.

1180. Athene brama.—The Spotted Owlet.

1183. Glaucidium cuculoides.—The Large Barred Owlet.

1187. NINOX SCUTULATA.—The Brown Hawk-Owl.

1217. SPILORNIS CHEELA.—The Crested Serpent-Eagle.

1220. BUTASTUR TEESA.—The White-eyed Buzzard-Eagle.

1228. HALIASTUR INDUS.—The Brahminy Kite.

12.36. CIRCUS MELANOLEUCUS.—The Pied Harrier.

1244. ASTUR BADIUS.—The Shikra.

1265. TINNUNCULUS ALAUDARIUS.—The Kestrel.

1270. POLIOHIERAX INSIGNIS.—Feilden's Hawk.

This Hawk was obtained at several localities in the Lower Chindwin.

1271. CROCOPUS PHŒNICOPTERUS.—The Bengal Green Pigeon.

1273. OSMOTRERON PHAYREI.—The Ashy-headed Green Pigeon.

1284. CARPOPHAGA ÆNEA.—The Green Imperial Pigeon.

1291. CHALCOPHAPS INDICA.—The Bronze-winged Dove.

1304. TURTUR ORIENTALIS.—The Rufous Turtle-Dove.

1308. TURTUR TIGRINUS —The Malay Spotted Dove.

— TURTUR XANTHOCYCLUS, Newman, Agricultural Mag., 1906, p. 321. —The Burmese Ring-Dove.

The Burmese Ring-Dove has been separated from its Indian ally by reason of the broad yellow ring of bare skin round the eye, this ring being of smaller extent and of a whitish colour in the Indian bird (*T. risorious*).

Some Doves of this species were taken home by Mr. W. G. Bligh from Upper Burma, and they lived in the Zoological Gardens of London for a considerable time.

1311. ŒNOPOPELIA TRANQUEBARICA.—The Red Turtle-Dove.

1312. MACROPYGIA TUSALIA.—The Bar-tailed Cuckoo-Dove.

Procured in the Lower Chindwin.

— GENNÆUS WILLIAMSI, Oates, Game Birds of India, i., p. 342 (1898) —Williams's Silver Pheasant.

This well-marked species occurs over the greater part of the Upper and Lower Chindwin, up to about 3,000 feet of elevation. Some forty specimens were obtained.

The adult male measures about 25·5 inches in length, of which the tail measures 11·5 inches. The wing measures about 9·5 inches. Young males have the tail almost straight and measuring only 8·5 inches, and the wing 8·3 inches. The females are about 22 inches in length; the tail measures from 8 to 8·5 inches and the wing varies from 8 to 8·5 inches.

1355. COTURNIX COMMUNIS—The Grey Quail.

One specimen shot at Yu-wa.

— COTURNIX JAPONICA.—The Japanese Quail.

Two specimens were obtained at Yu-wa. There should be little difficulty in discriminating between this species and the Grey Quail. In the adult male of the Japanese Quail, the chin, throat and cheeks are uniform brick-red, sometimes with a central blackish throat-stripe. This stripe, I think, characterises the very old male.

The females at all ages and young males before they assume the rufous throat may be recognized by the lengthened and sharply pointed feathers on the cheeks. These feathers are never seen on the female or young male of the Grey Quail.

1356. Coturnix coromandelica.—The Rain Quail.

1374. Francolinus chinensis.—The Eastern Francolin.

Appears to be generally distributed.

1382. Turnix pugnax.—The Bustard-Quail.

1401. Amaurornis phœnicurus.—The White-breasted Water-hen.

1428. Metopidius indicus.—The Bronze-winged Jacana.

1432. Sarcogrammus atrinuchalis.—The Burmese Wattled Lapwing.

1434. Microsarcops cinereus.—The Grey-headed Lapwing.

One specimen from Mingin.

1446. Ægialitis alexandrina.—The Kentish Plover.

1447. Ægialitis dubia.—The Little Ringed Plover.

1461. Totanus glareola.—The Wood Sandpiper.

1462. Totanus ochropus —The Green Sandpiper.

1466. Totanus glottis.—The Greenshank.

1503. Sterna seena.—The Indian River-Tern.

1529. Plotus melanogaster.—The Indian Darter.

1555. Ardea cinerea.—The Common Heron.

1561. Herodias garzetta.—The Little Egret.

1565. Ardeola grayi.—The Pond Heron.

1567. Butorides javanica.—The Little Green Heron.

1571. Ardetta sinensis.—The Yellow Bittern.

1572. Ardetta cinnamomea.—The Chestnut Bittern.

1573. Dupetor flavicollis.—The Black Bittern.

THE ORCHIDS OF THE BOMBAY PRESIDENCY.

BY

G. A. GAMMIE, F.L.S.

PART V. (WITH PLATE IV.)

(*Continued from page* 941 *of Volume XVII of this Journal.*)

The next Tribe to be dealt with is the *Vandeæ*, of which the general characters have already been given on p. 433 (Vol. XVI).

It contains the majority of our finest and most showy orchids.

A. *Pseudobulbs* subterranean, rotund, *scapes* rising from the surface of the ground. *Leaves* usually developed some time after the flowers have withered.

12. EULOPHIA.

B. On trees. *Leaves* long, strap-shaped, in dense masses; *racemes* long, pendulous, *flowers* moderately large.

13. CYMBIDIUM.

C. A ground orchid. *Leaves* alternate, plaited, *flowers* white or pink in a dense, curved raceme.

14. GEODORUM.

D. Epiphyte. *Leaves* distichous, sheathing *petioles* compressed, *flowers* small, yellow, in a cluster at the top of the scape.

15. POLYSTACHYA.

E. Epiphyte. *Stems* and *leaves* quill like. *Flowers* rather small, dark coloured, in short spikes.

16. LUISIA.

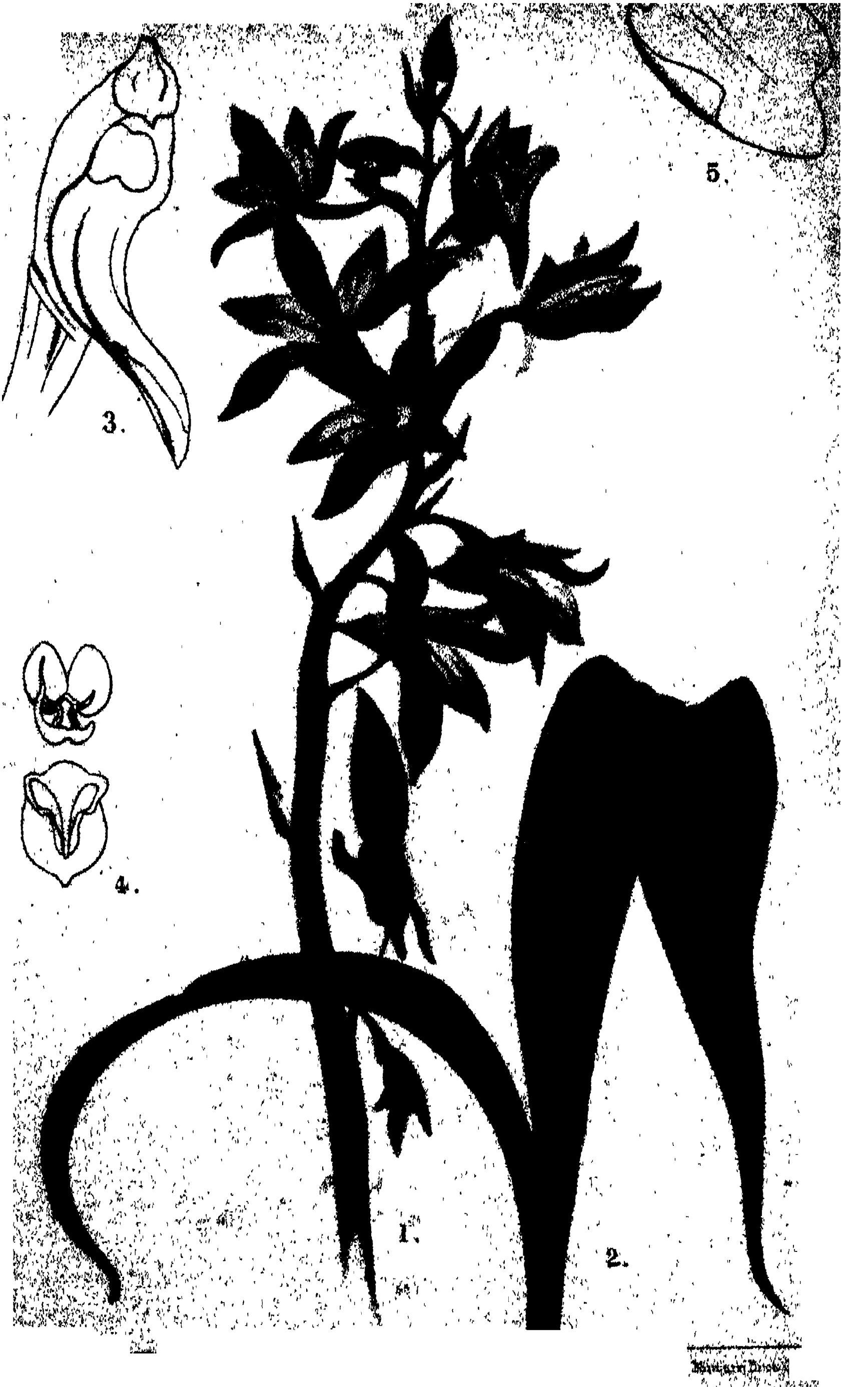
F. Epiphytes. *Leaves* 2-ranked, strap-shaped, often longitudinally folded inwards, *flowers* showy in racemes or panicles.

17. COTTONIA. *Flowers* at the top of a very long stalked raceme. *Lip* simulating a bee.

18. RHYNCHOSTYLIS. *Racemes* of pink flowers, densely cylindrical, pendulous.

19. ÆRIDES. *Flowers* rose-coloured, in more loosely arranged racemes, which occasionally develop branches, thus becoming panicles in well-grown examples.

20. VANDA. In one form, *flowers* large, with brown tessellated



EULOPHIA PRATENSIS, Lindl.

sepals and *petals*; in another, *flowers* rather small, *petals* and *sepals* dull uniform yellow.

21. SACCOLABIUM. *Sepals* and *petals* spreading, *spur* not septate within and without a scale under the column.

22. SARCANTHUS. As in Saccolabium, but *spur* longitudinally septate and with a scale under the column.

23. CLEISOSTOMA. Differs from Sarcanthus in the non-septate spur and from Saccolabium in having a scale within the spur, beneath the column.

24. DIPLOCENTRUM. *Lip* 2-spurred.

12. EULOPHIA.

Ground orchids. *Pseudobulbs* tuber-like. *Leaves* plaited, appearing with the flowers or some time after. *Flowers* in racemes. *Sepals* and *petals* spreading, *lip* erect from the base or foot of the column, base saccate or with a short spur, lateral lobes embracing the column, midlobe spreading, usually recurved, disk crested. *Column* short or long, top oblique entire, *anthers* 2-celled, *pollinia* 2 or 4, sessile or with a short stalk.

* *Lip* longer than broad, side lobes short or O.

Stalk of *raceme* with broad, loose sheaths, *racemes* many and rather densely-flowered .... 1. *E. ochreata.*

Stalk of *raceme* with large acuminate sheaths, *bracts* very long, *flowers* large, in a few-flowered *raceme*. 2. *E. herbacea.*

* * *Lip* broader than long, side lobes short or O ... 3. *E. pratensis.*

* * * *Column* produced into a foot, *lateral sepals* on the spur of the lip, *flowers* large, very variable in colour...... .... 4 *E. nuda.*

1. EULOPHIA OCHREATA, *Lindl.* Fl. Br. Ind. VI. 2; Dalz. and Gibs., p. 265.

Stem stout. *Leaves* 3 to 5, elliptic acuminate, many-nerved, sessile. *Scape* stout, up to a foot in length, with broad loose sheaths, *racemes* 4 to 5 inches long, dense, cylindrical, *bracts* lanceolate, as long as the ovary, *flowers* membranous, *sepals* ¾ inch long, linear oblong concave, *petals* flat, broadly ovate acute, *lip* broedly ovate, entire obtuse, serrated and with the veins fringed, *spur* a small sac.

Recorded from the Konkan and North Kanara by Law, Dalzell and others. It is not included by Woodrow in his Synopsis. The colour of the flower is not noted by Dalzell and Hooker. I once received a specimen from Mr. C. D.

Mahaluxmivala, but this with my notes was lost in May 1902. It probably flowers during the rains.

2. EULOPHIA HERBACEA, *Lindl.* Fl. Br. Ind. VI. 2; Dalz. and Gibs., p. 265.

Tuber round. *Stem* slender from 6 to 18 inches long. *Leaves* lanceolate, many-nerved, 6 to 8 inches long, *scape* 2 to 3 feet, stout, *sheaths* large, long pointed; *flowers* 8 to 10 on a raceme, about 3 inches broad, *bracts* 2 inches long, twice the length of the stalk and ovary combined, *sepals* 1½ inch long, linear lanceolate pointed, green, *petals* variable, oval or lanceolate acute or obtuse, many-nerved, usually white with purple veins, *lip* white with yellow veins, obovate oblong, side lobes small, rounded, midlobe ovate oblong, *disk* with many fringed nerves, *spur* very short, blunt.

Flowers during the rains.

Distribution.—Konkan, Panch Mahals (*Woodrow*), Western Himalayas and Bengal.

3. EULOPHIA PRATENSIS, *Lindl.* Fl. Br. Ind. VI. 4, Dalz. and Gibs., p. 265.

About 18 inches in height. *Leaves*, appearing during the rains, narrowly lanceolate, three-nerved, one foot long by one inch broad, *scape* racemose on its upper half, *sheaths* appressed, *bracts* short, ovate-lanceolate, *sepals* oblong, obtuse, 1¼ inch long, brown, *petals* similar but shorter, ⅝ inch long, light yellow with brown tips, *lip* sessile, lateral lobes pale yellow, oblong, rounded, midlobe small yellow, with three irregular crenate nerves ending in crenate calli on the midlobe, *spur* conical, pointed.

Flowers in the Deccan in damp grassy pastures during the cold weather. Sir J. D. Hooker says that Lindley and the Bombay Flora err in describing this species as leafless when flowering They are quite correct. The leaves seldom make their appearance until August or even later.

Distribution.—The Deccan and Konkan.

Plate IV.—*Eulophia pratensis*, Lindl., Fig. 1. Upper part of flower shoot. Fig. 2. Upper part of leaf shoot. Fig. 3. Column (enlarged). Fig. 4. Anther and cap (enlarged). Fig. 5. Lip (enlarged). Drawn by Mrs. E. Silcock.

4. EULOPHIA NUDA, *Wall.* Fl. Br. Ind., VI, 5; *E. bicolor*, Dalz., and Gibs., p. 264.

Tuber green, often as large as the fist. *Leaves* elliptic, lanceolate, *raceme* up to 3 feet long, many-flowered, *bracts* about equalling the ovary, *flowers* about 2 inches broad, exceedingly variable in coloration, *sepals* linear, oblong acute, *petals* shorter, many-nerved, *lip* shorter than the sepals, lateral lobes low, rounded, midlobe quadrate, channelled at tip, *disk* with about 10 raised lines, margins crisped.

The following are descriptions of varieties of the flowers of this species found by Mr. Spooner and myself on the Belgaum Ghats :—

1. *Sepals* dark velvety brown, narrowly margined with light yellow, acute, one-third longer than the obtuse petals which are of a ruddier tinge. *Lip* of the same colour. *Peduncle* brown below, greenish above.

2. *Sepals* green, longitudinal nerves purple, *petals* pale yellow, *lip* pink, lateral lobes yellow suffused with purple, nerves of disk and lateral lobes with purple ridges.

3. *Sepals* green, slightly purple at base, *petals* a lighter green, *lip* altogether white, *spur* with a green suffusion.

4. *var. nov.* SPOONERI. *Sepals* green, striated with purple, *petals* yellow, uniformly suffused with brown on the back, lower half of the inner surface brown, *lip* rose purple, ridges on disk a darker purple.

5. *Sepals* dark green, shaded with brown on both sides, the external surface almost purple brown, *petals* greenish white, striated with brown on the inner surface, base of the *lip* green, lateral lobes green striated with brown, midlobe white striated with purple, centre of lip with a blotch of pale yellow.

6. *Sepals* pale green, lightly shaded with purple brown on both surfaces, *petals* white, striated with pale green. *Lip* white.

As variety 4 is perhaps the finest and most striking of the series I have dedicated it to Mr. Spooner who has generously assisted me by sending many rare orchids in flower.

This species flowers in the month of May and is abundant in the forest of the Belgaum and North Kanara Ghats. Sir J. D. Hooker suspected that there must be more than one species, so great are the differences in the colour of the flower ; but, so far as I have seen, the plant varies but slightly in the form of the parts of the flower. The tubers vary considerably in size, but that may be due to soil and age of the plant.

Distribution.—Eastern Himalaya, Assam, Khasia Hills eastward to Burma, the Western Ghats to the southward and Ceylon.

(*To be continued.*)

SOME INDIAN FRESHWATER SHELLS.

BY

GORDON DALGLIESH.

The fresh waters of India are particularly rich in Molluscan fauna, and as the hobby of shell collecting is a favourite one with many people, I venture to think that this paper may be of service to some of our members. The great drawback to collecting in India is the want of a good and well illustrated work on the subject. Our mammals, birds, reptiles, fishes and insects have been well studied as is shown by the series of excellent volumes on the Fauna of British India, but one of the most interesting branches of Natural History, namely, the Mollusca, have been somewhat neglected. There is an excellent work on the subject by Messrs. Theobald and Hanley, though now somewhat out of date, on the Land and Freshwater Shells of India, which contains beautifully coloured figures, but I fancy only second-hand copies are now obtainable and even these are very expensive and quite beyond the means of the ordinary student. My best thanks are due to Captain Peile, R.A., for specimens and much kindly help, also to Messrs. Sowerby and Fulton for many interesting species, and to Mr. Waterhouse, Librarian of the Zoological Library, London, for allowing me to consult works of reference, without the help of which I could not have attempted this paper, and lastly to Mr. E. A. Smith of the British Museum for the trouble he has taken in naming specimens for me.

COLLECTING SHELLS.

For the formation of a collection of freshwater shells few implements are needed. These are: a water net, a small dredge, an iron hook attached to the end of a stout stick, and a number of chip boxes. The water net should consist of a strong iron ring to which is attached a bag of fairly thick canvas, the net, of course, secured to a stick of convenient length.* This will be found ndispensable for sweeping among weeds, and for capturing any stray snail that may be floating on the surface of the water. A dredge will be found useful for collecting bivalves which lie buried in the mud, and is made exactly on the same principle as that used by fishermen at home for oysters, etc. The hook will come in handy for drawing to the bank masses of weed which should be *thoroughly* examined for small specimens entangled therein. For the capture of large *Unios* (Mussels) out of arm's reach the following method is recommended: Cut a long stick to a fine point and carefully insert the pointed end into the inhalant syphon; the animal immediately closes the valves of the shell, and with such firm pressure that it clings to the improvised fishing-rod and may be bodily withdrawn from the water. This method, which is simple enough as soon as the eye has become accustomed to the refraction due to the surface of the water, has the advantage of not stirring up the mud, so that the water remains clear and other specimens are obtainable at the same spot.*

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* All the implements mentioned can be obtained from any dealer in Natural History Apparatus. The Army and Navy Stores in Bombay and Calcutta supply apparatus of all kinds for the use of naturalists.

All specimens should if possible be collected alive, dead and worn ones being of little or no value. They should then be plunged into *boiling* water; this causes instant death to the animal which may then be removed in the case of bivalves by the aid of a small blade and univalves by a stout pin. It will often be noticed that many shells have on them a green slimy growth. This to a great extent may be removed by careful brushing with an old tooth-brush and plenty of hot water. Some collectors however prefer to leave this growth. All that is now necessary is to set aside the shells to thoroughly dry. Bivalves after the death of the animal are apt to gape apart. The two valves must be drawn together by binding cotton round and tightly securing, and the cotton should not be removed for some days allowing the ligaments of the shell to thoroughly dry. For very small bivalves where binding is not possible a strong cement should be used. Many of the univalves as *Vivipara* and *Ampullaria* have a horny covering (operculum) at the mouth of the shell. As this adds to the value of the specimen it should be carefully removed from the animal and placed in its natural position within the mouth of the shell with a little cement on a plug of cotton wool.

ARRANGEMENT OF A COLLECTION.

For the display of a collection of shells a cabinet is the best medium, the drawers being divided into a number of partitions of different sizes. The larger specimens are then laid on cottonwool placed in the divisions. For smaller and more delicate specimens glass top boxes are very nice and help considerably to give more show to a collection. Every specimen should of course be labelled as recommended below. As many of us in India, however, have no settled abode and are liable to be transferred at a moment's notice, a cabinet becomes somewhat of a nuisance in transit and unless specimens are securely packed they are likely to get broken. For my own part I much prefer to have all my shells in chip or pill boxes. Very useful boxes for the storage of specimens are sold by most dealers and known as "purple shouldered" boxes. These are nested and are of various sizes, the most useful all round size being 2" in diameter. They are in every way vastly superior to the ordinary chip box, being made of stout cardboard and much stronger. These boxes, together with the specimens they contain, are easily packed into quite a small space and there is no risk of breakage during a journey. The boxes have white tops to the lids. On this should be written the name of the shell, locality, date, and name of collector. A corresponding ticket should accompany each shell inside the box. It is also important to add one or two other items such as altitude, whether found in a small pond, stream, river, or lake, and any other detail that may strike the collector.

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* Latter. Natural History of Common Animals.

LIFE HISTORIES.

Among the *Gasteropoda*, one of the largest families are the *Limnæidæ* or water-snails as they are commonly called, and are found in more or less abundance in all ponds, lakes, and rivers. Like land-snails they breathe air and frequently come to the surface to obtain this. Other species of *Gasteropoda* on the other hand breathe dissolved oxygen by means of gills which are situated beneath the shell.

The *Limnæidæ* are hermaphrodite, but "the male and female apertures are separate from one another, the latter being situated beneath the mantle flap some distance from the former, which is placed as in *Helix*."* The eggs of *Limnæa* are deposited in long jelly-like masses and fastened to water weeds. In aquaria *Limnæa* will be found very useful devouring the green scum that so thickly adheres to the sides, and they moreover help to keep the water fresh and pure.

Unio may be taken as a typical bivalve, and the life history of this is extremely curious and interesting. If an ordinary pond mussel be examined closely when at rest in the water, at the anterior part of the shell the mantle folds will be seen slightly projecting their edges forming two short tubes. These are known as the inhalant syphon, and it is through this the animal breathes and feeds. Immediately above the inhalant syphon will be seen a short tube known as the exhalant syphon through which all waste matter is expelled. The large fleshy organ protruding from the front of the shell is known as the "foot" by means of which the animal moves and buries itself in the mud. It has been roughly estimated that the rate of progress in a year is one mile. Mussels are extremely sensitive to vibrations, and if some be kept in a bowl a heavy foot-fall near at hand is sufficient to cause every individual to immediately close its shell, and this is due to certain powerful muscles which will be found on dissection adhering to the shell, and indeed so tightly are the valves closed as to render the opening of a live mussel an impossibility without breaking the shell. The sexes are separate, rarely hermaphrodite, and it is said females are more abundant than males. There is no union of sexes. The spermatozoa of the male is discharged into the water and carried by ciliary currents into the inhalant syphon of the female. The eggs pass into the gill plates which serve as brood pouches. Young mussels when first hatched fix themselves to the tail or fin of a fish and then form a cyst which completely covers them, and thus for a time live as a parasite feeding on the tissues of their host. Eventually the cyst withers and the young mussel drops off to lead an independent life like its parent.

ECONOMIC USES.

As an article of diet, freshwater molluscs are of little or no importance to mankind. Their shells, however, are used extensively for the manufacture of lime, and the gathering of them for this purpose is an industry carried on in many parts of India. Some of the *Unios* produce pearls of some value.

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* Latter, Natural History of Some Common Animals.

One Indian species, namely *Unio favidens*, is especially so noted. In Great Britain a few of these pearl fisheries still exist in parts of Ireland and Scotland, the mussel producing these being *Unio margaritifer*. We read that the Tay fishery was at one time very productive, and in three years pearls were obtained to the value of £10,000. Mother-of-pearl is rarely if ever obtained now from freshwater mussels, this industry having subsided owing to the large numbers of pearl oysters (*Meleagrina margaritifera*) used for that purpose. Nevertheless many Indian species of *Unio* are especially rich in brilliant nacre.

In the descriptions of the following shells I have purposely avoided many technical terms which are so often puzzling to a beginner, but this has not always been possible, hence the following explanations have been added for the benefit of those who are not experienced in "shell lore" by which a shell is described.

Take a shell of any snail and observe :

(1) An *aperture* or *mouth.*

(2) The *lip* bordering the mouth.

(3) The *nucleus* or apex of the cone is the oldest part at the top of the spire.

(4) *Lines of growth* are transverse ridges parallel to the mouth and indicate successive positions of the mouth during the growth of the shell.

Take a shell of a *Unio* and observe—

Outer surface—

(1) The *shape.*

(2) The *umbo*, the oldest part of the valve of each shell lying close to the hinge line and about a ¼ of the length of the shell from its anterior end.

(3) *Lines of growth* are concentric curves on the surface of the shell marking growth stages. Each line was at one time the margin of the shell.

(4) The *ligament* connecting the two valves together along the mid-dorsal line.

Inner surface—I.—

(1) The white pearly appearance. Here lines of growth are visible but not so readily distinguished as on the outside.

(2) The *teeth.* Two shelly ridges just under the ligament, the *Hinge teeth.* Two shorter projections at the posterior end, the *Posterior teeth.*

II.—*Muscular Impressions.*

These are slight depressions on the surface and mark the place of attachment of the animal to the shell.

(1) *Anterior adductor impression.*—Is a large oval depressed area close to the anterior end of the shell and near the dorsal edge.

(2) *Anterior retractor impression.*—Small and continuous with the posterior border of the anterior adductor impression.

(3) *Protractor impression.*—A small impression behind the lower part of anterior adductor impression.

(4) *Posterior retractor impression.*—Small and continuous with the upper and anterior edge of adductor impression.

(5) The *Pallial line* is the line of attachment of the mantle to the shell running almost parallel to the ventral edge of the shell.

Structure of Shell.

(1) An outer coloured "*Periostracum*" or skin.

(2) A middle or prismatic layer which is densely calcified.

(3) An inner nacreous or pearly layer often highly iridescent.

The following shells are the more common kinds the collector is most likely to meet with, and the descriptions and measurements are taken from specimens in my own collection. All measurements are in *millimetres* and must only be regarded as approximate, though I have taken especial pains to select only adult specimens.

GASTEROPODA.

NERITIDÆ.

Neritina perotetiana (Recluz).

Shell.—Thick with very small spire. Operculum shelly. Underside expanded and flattened above the mouth.

Colour.—Above dark brown to black. Flattened portion whitish.

Length.—11. Hill streams in the Nilgiris.

VIVIPARIDÆ.

Vivipara bengalensis (Lmk).

Shell.—Conical. Whorls five. Operculum shelly.

Colour.—Greenish banded very strikingly with reddish brown.

Length.—35.

This is an exceedingly common shell, especially so in Bengal, being found in all rivers and marshes. All the *Viviparidæ*, as the name implies, are viviparous and the young shells have rows of epidermal cirri.

V. dissimilis (Müll).

Shell.—Conical, operculum thick and horny. Whorls 4.

Colour.—Green when clean but often eroded with a slimy growth. Some specimens I have are of a clear amber colour, but this may be due to decay as they were all picked up dead.

Length.—20. Found in same situations as the last.

V. præmorsa (Bens).

Shell.—Conical. Whorls 4-5. Operculum thick and horny.

Colour.—A uniform olive-yellow. A brown thin line round the lip. Marked with faint line chiefly on underside.

Length.—25.

V. ceylanica (Dohrn).

Shell.—Conical. Lip acute. Whorls 5. Operculum very thick.

Colour.—A uniform reddish yellow. Lip black.

Length.—23. Island of Ceylon. Common.

V. crassa (Hut).

Shell.—Globular. Lip rounded. Whorls 4.

Colour.—Whitish yellow. Lip black. Inside mouth pale greyish blue.

Length.—23.

AMPULLARIIDÆ.

Ampullaria globosa (Swain).

Shell.—Globular. Spire very small and rounded. Whorls 7, gradually getting smaller until hardly distinguishable towards spire. Operculum thick and shelly.

Colour.—Greenish olive marked with faint lines of dark green. Lip whitish.

Length.—71.

One of the most characteristic of Indian freshwater shells.

The animal has a long incurrent syphon formed by the neck lappet. *Ampullaria* is found in lakes and rivers and during drought retires very deep into the mud, passing the time in a state of torpidity. Eggs large and enclosed in capsules.

A. carinata (Swain).

Shell.—Globular. Second whorl distinctly flattened at top. Whorls 6. Operculum thick and shelly.

Colour.—Olive brown. Broad black outer lip. Whole shell often *very* faintly streaked with white.

Length.—51. The South of India.

A. nux (Reeve).

Shell.—Globular. Tip rounded and often so eroded as to make it impossible to distinguish the number of whorls. Operculum thick and shelly.

Colour.—Yellowish brown. Lip whitish.

Length.—27. Mountain streams in the South.

MELANIIDÆ.

The *Melaniidæ* are found in rivers and lakes throughout the warmer parts of the world. They are sometimes viviparous. The spire of the shell is often very eroded, due to acidity of the water. They are all operculate.

Melania elegans (Bens).

Shell.—Turretted and spiral. Whorls 7.

Colour.—Olive yellow, marked with brown wavy markings.

Length.—19·5.

M. tuberculata (Müll).

Shell.—Slender, tip of spire acute. Whorls 10.

Colour.—As in the last but may readily be distinguished from it by its larger size and slender appearance.

Length.—36.

This species has probably a wide range in the East, and I have specimens from Madras and Japan.

LIMNÆIDÆ.

The animals of this family have all very thin horn-coloured shells. They lower themselves from aquatic plants by a mucous thread and ascend in the same way. They can often be seen gliding beneath the surface of the water shell downwards, and in cold weather and drought hybernate.

*Limnæa amygdalus** (Tras).

Shell.—Spiral. Whorls 4, mouth very large. Lip acute. Spire small.

Colour.—Yellowish. Extreme tip pink. Length 28. The only specimens of this shell I possess are from Bombay.

L. rufescens (Gray).

Shell.—Slightly more slender than the last. Whorls 4—5. Lip acute. Spire small.

Colour.—Yellowish with a pinky tinge.

Length.—30.

According to Mr. E. A. Smith this is only a variety of *L. acuminata* (Lam).

L. acuminata (Lam).

Differs only from the last in having a blunter spire.

L. pinguis (Dohrn).

Shell.—As in the two last. Mouth smaller. Whole shell having a tendency to curve to the right. Whorls 5.

Colour.—A clear amber.

Length.—21. I have specimens of this from Madras.

L. bulla (Bens).

Shell.—Having a more rounded and stumpy appearance than any of the above mentioned. Mouth fairly wide. Whorls 5—6.

Colour.—Yellow.

Length.—23·5.

Planorbis indicus (Bens).

Shell.—Many whorled. Mouth crescentic.

Colour.—Bluish grey. Inner lip white.

Length.—13.

P. exustus (Desh).

Shell.—As in last. Upper surface ribbed.

Colour.—Yellowish white. Inside mouth white.

Length.—18. Pretty well distributed throughout India.

Planorbis compressus (Hutton).

Shell.—Small, very compressed, many whorled. Mouth oval.

Colour.—Yellowish white tinged in parts with grey.

Length.—8. Commonly distributed. *Planorbis* may be found frequently adhering to the under surface of water-lily leaves.

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* It is doubtful if *L. acuminata* and *amygdalus* can be regarded as distinct species but rather as varieties of *L. rufescens*. In giving them full specific rank I am following the nomenclature adopted by Messrs. Sowerby and Fulton.

PELECYPODA.

UNIONIDÆ.

Shells of this family are regular, equivalve, closed. A nacreous structure. Periostracum often thick. An external ligament large. Well developed hinge teeth.

Animal with mantle margins united between siphonal orifices. Organ of locomotion, the " foot ", large. Sexes distinct. Of universal distribution in lakes, ponds and rivers.

Unio corrugatus (Smith).

Shell.—Roundish tapering towards anterior. Hinge thick and prominent. Outside of shell thick and olive brown, sometimes greenish. Umbo often eroded. Interior white with iridescent hues. Hinge teeth large and thick.

Length.—48″.

U. cæruleus (Lea).

Shell.—Somewhat oval, lengthened. Hinge not so pronounced as in the last. Teeth small. In colour this species varies. Some I have are externally olive yellow, others again are a beautiful bluish green. Interior bluish white.

Length.—56·5. I have specimens from Tirhoot, Cachar and Delhi.

U. flavidens (Bens).

Shell.—Oval, thick, hinge well developed. Whole shell very thick. Exterior a mixture of brown green and yellow. Interior of shell yellow in some, salmon-pink in others. Hinge teeth thick. Posterior teeth serrated. Aductor scars very pronounced. Umbo as a rule eroded.

Length.—52·5. I have specimens from Calcutta, Tirhoot and Cachar.

U. marginalis (Lk).

Shell.—When adult large, oval. Hinge large and thick. Exterior a brownish black in some specimens, olive brown in others. Hinge teeth large and very iridescent. Posterior teeth thick and finely serrated. Whole interior surface very iridescent. In a number of specimens I have examined they all show small pearly outgrowths towards anterior. One specimen I have, given me by Capt. Peile and collected at Poona, the whole inside of the shell is orange yellow.

Length.—86 to 96. I have specimens from Calcutta, Poona, Cachar and Tirhoot.

U. lamellatus (Lea).

Shell.—Thin. Teeth small. Exterior olive brown. Interior very iridescent.

Length.—83.

U. sikhimensis (Lea).

Shell.—Somewhat oval. Hinge very well developed. Exterior greenish and olive brown. Posterior teeth well developed. Interior bluish white.

Length.—36·5.

U. crispisulcatus (Bens).

Size small. Exterior very much serrated.

Colour.—A clear greenish yellow. Shape somewhat oval. Teeth well developed. Interior a clear white and very iridescent.

Length.—29·5. A very beautiful little shell. I have only been able to examine one specimen, but this appears to be quite adult.

Corbicula occidens (Bens).

Shell.—Orbicular, furrowed. Epidermis polished. Lateral teeth elongated.

Colour.—Greenish yellow. Umbo purple. Interior purple.

Length.—16·5.

C. striatella (Desh).

Shell.—In shape not differing from the last in any marked degree, being perhaps slightly more robust.

Colour.—Variable. Some I have are greenish brown ; others purplish grey externally, greyish purple internally. One specimen I have, kindly given to me by Captain Peile, was taken in hot springs at Kopili river at 2,000 feet, and has the whole umbo much eroded and eaten away.

Length.—20.

NOTES ON SNAKES COLLECTED IN FYZABAD.

By

MAJOR F. WALL, I.M.S., C.M.Z.S.

Climate.—Fyzabad enjoys a first-rate cold season which may be said to extend proximately between the 1st November and the 28th February. Even at the coldest period, however, the sun shines hotly for many hours in the day, and one would expect sufficiently to entice snakes abroad to bask, and revel in its genial rays. The figures in my table of seasonal abundance show that but few are abroad at all during the cold months, and though when out duck-shooting I occasionally saw a snake, and usually a *Tropidonotus piscator* in the jheels, the majority that came in to me during that time had been disturbed during some earth work.

The hot season, which is one of average drought, ended in the year 1905 on the 1st of July when heavy rains began. In the year 1906 the rains broke on the 18th of June.

My residence in Fyzabad covered a somewhat broken period of 23 months, but 4 months' absence on leave makes the actual time spent in making my collection 19 months, and of these fully 8 were embraced in two cold seasons.

My sum total of specimens amounted to 704, but this large total only included 18 different species, one of which proved to be new to science (*Bungarus walli*).

With very few exceptions (say a dozen) everyone of these specimens were captured in cantonments or close at hand. Perhaps a diameter of 3 miles would cover the area productive of this total.

Only 3 species were poisonous, the aggregate amounting to 107. About 2 specimens in 13 therefore were poisonous.

1 specimen in every 11 was a common krait (*Bungarus candidus*), 1 in every 88 a Wall's krait (*Bungarus walli*), and 1 in every 18 a cobra (*Naia tripudians*).

Snakebite.—The only cases of snakebite that came to my knowledge were five. In these cases I traced the offender, and it proved to be *Tropidonotus piscator* on three occasions, and *Lycodon aulicus* on two occasions, both harmless species.

I saw another case reputed to be one of snakebite in the Cantonment Hospital. The offender had not been captured, and I expressed the opinion that the bite, if inflicted by a snake at all, was caused by a harmless kind. The man showed no symptoms of inoculation by snake venom, and speedily recovered when reassured as to the nature of the wounds. One case only that I heard of was probably one of snake-poisoning. I was absent from the station at the time, but the medical officer who attended, and was called in only when the man was in the act of expiring, related the conditions which made a diagnosis of snake-poisoning extremely probable. The Cantonment Magistrate very kindly furnished me with the reputed fatalities from snakebite in the Cantonment for a period of ten years, and though they appear astonishingly few when one considers the large population of poisonous snakes and the numbers of barefooted people in Cantonments, it is a fact that the figures returned for this station represent a mortality more than twice the average for the whole of India. Recently a question was put in the House of Commons asking the snakebite mortality for India, which elicited the following figures from Mr. Morley for thirty years up to 1905. The average in the first decade was 95·5 per annum per million, for the second 100·9, and for the third 98·1, *i.e.*, 98 per million for 30 years. It will be seen that in ten years in Fyzabad Cantonments 11 deaths were returned as due to snakebite.

Deaths from Snakebite in Fyzabad.

Year.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	Total.
Male	1	...	...	1	3	...	...	1	...	1	7
Female	1	...	...	1	...	...	1	...	...	1	4
Total ...	2	...	...	2	3	...	1	1	...	2	11

According to the Census of 1891 the Cantonment population was 5,346. This for five years amounts to 26,730. The population in 1901 was 6,096, so that for five years the figures are 30,480.

The aggregate population for this decade may be taken, therefore, as 57,210.

11 deaths in a population of 57,210 works out to about 198 per million.

Tabular List of 704 Snakes collected in Fyzabad.

	NAME OF SNAKE.	1904		1905.												1906.								Date not recorded.	Total Examples.	Total Examples on 6th August, 1906.
		November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.			
1	Typhlops braminus	..	1	..	1	1	..	..	..	..	Absent on leave 1st August to 30th September.	..	..	..	..	..	..	1	..	Absent on leave 12th April to 11th June.	.	8	..	..	12	..
2	Python molurus	..	..	..	..	..	..	..	..	..		1	..	..	..	..	..	.	..		.	.		..	1	..
3	Xen. cerasogaster	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	91	..	91	56
4	Trop. piscator	..	..	..	..	..	..	2	1	9		..	6	1	..	..	1	..	..		2	27	82	..	131	26
5	Trop. stolatus	4	5	..	..	2	3	4	10	26		..	5	3	..	..	..	1	..		6	42	45	.	156	7
6	Hel. schistosus	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	8	..	8	3
7	Lycodon striatus	..	1	..	..	..	1	1	..	1		..	..	..	..	..	..	1	..		..	1	7	..	13	1
8	Lycodon aulicus	..	..	..	.	..	3	6	3	5		..	1	2	1	2	..	3	..		..	6	3		35	..
9	Zamenis mucosus	..	1	..	..	..	1	2	7	16		..	3	..	2	..	..	.	..		3	31	14	..	80	1
10	Zam. fasciolatus	..	..	..	..	..	..	..	..	1		.	..	..	..	..	..	..	..		..	..	..	..	1	..
11	Simotes arnensis	..	..	..	..	..	1	1	..	..		..	2	..	..	..	..	2	1		..	4	5	..	16	..
12	Hyps. sieboldii	..	..	..	..	..	..	..	..	..		.	..	..	..	..	..	..	..		..	.	12	..	12	2
13	Dips. trigonatus	..	..	..	..	..	..	1	..	4		..	2	..	..	..	..	..	..		2	4	2	..	15	..
14	Psam. leithii	..	1	..	..	..	..	..	..	..		.	..	..	..	..	..	..	..		..	..	..	..	1	..
15	Psam. condanarus	..	..	..	..	..	..	..	..	1		..	..	1	..	..	..	1	.		..	1	19	..	23	3
16	Bungarus walli	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..		..	..	8	..	8	3
17	Bung. candidus	..	..	..	..	..	2	1	1	5		..	4	1	.	..	..	..	..		4	28	15	1	62	2
18	Naia tripudians	..	..	..	..	..	..	..	2	5		..	1	1	..	.	..	..	..		4	12	10	4	39	..
	GRAND TOTAL ..																								704	108

TYPHLOPIDÆ.

Typhlops braminus.

I obtained many specimens but failed to register many of them, so the total shown in my list is considerably below the mark.

The 8 specimens obtained in July 1906 were all recovered from the stomachs of young Kraits (*B. candidus*), which seem to subsist in the main on these defenceless little creatures.

BOIDÆ.

Python molurus.

A single young specimen was captured by fishermen in September 1905 either in or about the river Gogra, and was kept for some time as a pet by a lady, but refusing dainty offers of food died after a few weeks. Here I may mention that Mr. Prince, of the 85th Regiment, when out shooting in the United Provinces in an adjoining district, encountered and killed a gravid female on March 9th, 1906. It measured 18 feet 3 inches, and contained from 50 to 100 eggs the size of goose eggs.

COLUBRIDÆ.

Xenochrophis cerasogaster.

Of this extremely handsome species, for which I think the name "Painted Keelback" would be most appropriate, I obtained 91 specimens, and it is very remarkable that though it is evidently so common in this locality I was resident in Fyzabad for 22 months before I obtained my first example. I must, however, remark that August 1906 provided me with all my specimens, and that in August 1905 I was in the Hills. Of this large total 35 were brought me on the 6th August, the cause of this large and sudden influx being attributable to extensive floods which inundated many miles of country in the immediate vicinity, so that every knoll that remained above the surface of the water was abundantly tenanted with every sort of refugee, from animals the size of nilghai, cattle, pigs, etc., to those as diminutive as ants. Snakes literally swarmed in every direction, and many hundreds must have met an untimely death besides those that were brought in to me.

All the specimens at first came from the banks immediately bordering the water, but a few days later some specimens were sent to me which had been encountered in and about Cantonments and even in habitations a little distance removed from the water.

Of the 91 specimens only 11 exceeded 2 feet in length. Seven of these were females, 3 males, and 1 was not sexed. The largest male was 2 feet 1¾ inches, and the largest female 2 feet 6½ inches. 36 were not sexed, being either liberated, mutilated, or decomposed. Of those sexed 20 were males and 35 females.

No female was eggbound; the breeding season was evidently past.

The secretion of the anal glands in both sexes is pale yellow in colour. The male clasper is thickly set from base to extremity with small recurved claw-like processes.

The young of this year measured in August from 8⅞ to 11⅛ inches.

The navel involved 2 or 3 ventrals in 3 females, 12 ventrals intervening between it and the anal shield in 2, and 13 in 1 specimen.

The young of last year varied from 1 foot 3¾ inches to about 1 foot 6¾ inches, so that they grew about 7 inches in their first year.

Food.—I found many with a material *in gastro* too digested to recognise, until I found one with a freshly ingested shrimp, when I realised from the colour, texture, and fishy odour the true nature of the contents of other stomachs.

Habits.—From what has already been said of the circumstances attending the capture of my specimens, it is very evident that the species is aquatic or subaquatic in habit, a fact endorsed by the nature of its food.

Many of these specimens were brought alive, and undamaged, and I found them very quiet inoffensive little creatures, both young and old alike. They tried hard to escape, but when molested repeatedly betrayed alarm by erecting the body, and nervously protruding the tongue in the manner so typical of snakes. This organ is red at the base, and has black tips.

During erection the head and forebody are carried in a manner reminding one of a camel, and sustained in this attitude whilst the creature rhythmically inflates itself in usual anguine fashion, but it does so only to a moderate degree. During this effort the relatively constricted neck and forebody become more apparent and the body is seen to be fusiform in figure. I rarely succeeded in provoking one to bite, though they evinced much objection to being grasped.

Colour.—It is one of the most strikingly beautiful snakes I know. A moss-green hue often very bright in quality adorns the crown, and merges laterally into chocolate or cardinal. This chocolate or cardinal forms a postocular streak abruptly limiting the bright canary or white of the upper lip, and passes down the body along the flanks. In all the young the upper lip is glossy white, but this invariably changes so as to become a canary yellow in the adult. The lower lip is glossy white, more or less finely mottled with cardinal or chocolate, especially about the sutures.

A crimson eye emulates the ruby in the brilliancy and softness of its colour and the charm of its setting. The body dorsally is uniform, or nearly uniform olive-green of various shades, in which some darker spots are sometimes obscurely visible. Sometimes a more or less distinct lighter olive-green streak runs along the confines of the 5th and 6th rows above the ventrals. A well-defined flank line bright yellow in adults, white in young, runs along the edges of the ventrals and is continued almost to the tail tip. This is bordered below with a red or cardinal line, beginning in the neck, and ceasing at or before the vent. The contrast and definition of this dual band reminds one of a gay hat ribbon.

The belly is uniformly black posteriorly in the young, especially beneath the tail, but becomes more and more abundantly mottled with white anteriorly. In the adult the black is less protracted anteriorly, frequently merges to a crimson brown, or bright mahogany, and the white dappling is more extensive and pronounced. In specimens about to slough the red hues appear lilac.

The pointed snout and pronounced *canthus rostralis* deserve special mention, also the very unusual distensibility of the integument beneath the chin. Here the intervals are broader than the shields, and scales themselves, a feature which seems to me should argue a gastronomic taste for relatively large creatures, whereas this is not supported by fact.

Among the head shields the temporals are remarkable, perhaps unique among Indian snakes. They are elongate, and disposed in two oblique series of 3 each, the anterior being the larger.

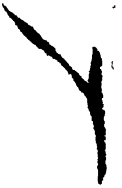
The penultimate supralabial is also remarkable in touching but one temporal.

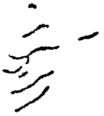
In a few specimens a few of the subcaudals were entire, the 3rd and 4th in one, 3rd, 4th and 5th in one, 4th and 5th, 8th and 9th in one, and 28th and 29th in another. The supralabials were abnormal in one or two. They were 9 with the 4th and 5th touching the eye in one, and 10 with the 5th only touching the eye in another. Both these aberrant features were present on one side only.

The scales two heads lengths after the head are 19, at midbody 19, and two heads lengths before the vent 17. The absorption from 19 to 17 rows is brought about by a disappearance of the 4th row above the ventrals, which becomes fused with the 3rd usually, sometimes the 5th.

Tropidonotus piscator.

Of this I obtained 131 specimens. As noted by me in other stations it is very little in evidence during the hot season, but emerges from retirement as soon as ever the rains break, and is then as abundant here as in other parts of India. I obtained two in May and one in June, 1905, and none at all during the hot season of 1906. All the other specimens were brought in after the rains were established. This species was responsible for three bites inflicted by snakes that I was able to trace to their origin, and in this connection it may be of interest to remark here how impossible it is to judge from the impressions of the teeth whether a bite has been inflicted by a poisonous or non-poisonous species. To hazard a guess under the circumstances is quite unjustifiable. I give the patterns of the wounds inflicted in two cases, drawn by me with extreme care.





A specimen I found one day whilst duck shooting had insinuated itself between some boards facing the supports of a bridge, and died a miserable death. The fact that it had struggled to drag its body through a fissure too narrow for it, instead of retracting it when conscious of undue compression, argues a very feeble intelligence.

Sexes.—Of 44 individuals sexed, 25 proved to be females and 19 males.

Breeding.—Only one gravid female was captured. This contained 47 eggs, $\frac{9}{10}$ of an inch long, on the 22nd February.

Hatching.—Though I got no hatchlings in either year before July, the size of some of the specimens I obtained in that month compared with the measurements of the young when hatching, and the rate of growth, both of which I am fully acquainted with, leave no doubt that they must have emerged in June or earlier. In July 1905 I obtained six, varying from 8¾ to 10⅝ inches, and in July 1906, seventeen specimens ranging from 8 to 12¼ inches in length.

Some of the very young were extremely active, struck out, and bit fiercely, and actually jumped off the ground in their endeavours to elude capture.

Food.—7 examples had fed recently. A single frog had formed the meal in three cases, two frogs in one case, one frog and three toads in another, and one toad in another. A hatchling 10¼ inches long was distended with tadpoles, of which I counted 8 or 9.

Colour.—All the specimens were with black or blackish spots. In some these spots were very large, in others about the size of the intervals, whilst in others they were much smaller. Every variation between these three types was met with. In some the spots were very black, giving off a bluish sheen on reflected light, in others they were sombre black, and in others again very obscure. The intensity of the black appears to be chiefly, if not entirely, dependent on the interval which has elapsed since the last desquamation. In no instance was there a suspicion of red adornment.

Tropidonotus stolatus.

156 specimens came into my hands. I sexed 118, and found 57 males and 61 females. They were most abundant in the rains, but during the hot season of 1905 I got 2 in March, 3 in April, 4 in May, and 10 in June.

Breeding.—I obtained in all 18 gravid females—14 in the month of July and 4 in August. 11 was the maximum number of eggs, 3 the minimum. One of these specimens brought alive I kept, and she deposited a single egg on the 7th, and 10 more on the 13th of July. In all the other cases the mothers were dead, and the eggs found *in abdomina.*

On the 30th of July 1906 some sepoys in my regiment brought me two specimens which they told me they had found fighting. They proved to be a male and a female, the latter heavily gravid with 10 eggs in an advanced degree of maturity. Whether this young gentleman was pushing his attentions too far, and really provoking the expectant dame to a righteous indignation and exhibition of temper, must remain a matter of conjecture, but it seems to me the probable explanation of the incident. They were described as confronting one another, and rearing up their bodies, and this behaviour had been witnessed some minutes before they were rushed upon and captured.

Food.—Several specimens had freshly fed. One contained a small toad (*Bufo andersonii*), and all the rest frogs. One I found had swallowed 3 small *Microhyla ornata*, and another a single frog of the same species. Another had dined off *Rana tigrina*, and another was discusing a *Rana breviceps*. In the last instance the frog disadvantageously seized was still alive, but a large rent in his side through which much lung substance was protruding, told its own story.

In one case the meal was too far digested to recognise except that it was batrachian in character. I am surprised to see on consulting Mr. Boulenger's Catalogue (Vol. 1, 1893, p. 253) that he remarks on the labials of this species: " Eight upper labials normally, third, fourth, and fifth entering the eye."

This I found true with many exceptions however (10 out of 50) of my Cannanore specimens, the exceptions in almost every case having seven labials with the 3rd and 4th only touching the eye. It is rather curious that in Fyzabad the rule and the exceptions characteristic of Cannanore specimens, are reversed. Thus in Fyzabad examples, where I have recorded the labials, 66 are peculiar in having seven labials with the 3rd and 4th touching the eye, and but 21 have eight labials with the 5th also touching the eye. In 2 examples the labials were eight, with the 4th and 5th only touching the eye.

Colour.—Every one of the Fyzabad specimens were what I stigmatise the blue variety. In these the overlapped edges of the scales are blue. I never saw any red adornment either beneath the scales, on the neck, or on the belly, with the exception of the slight and obscure roseate streak that so often passes along the flanks where the ventrals meet the last row of costals.

Helicops schistosus.

I obtained all my 8 specimens in the month of August. 5 of these were females, 3 males.

It is to be noted that the ventrals in these specimens ranged between 145 and 157, whereas in 13 specimens I obtained in Bangalore they vary from 139 to 149. There is therefore a decided tendency for these shields to exceed those of southern examples. Added to this one very noticeable feature in my Fyzabad specimens was the complete absence of the red line which in southern specimens runs along the confines of the 5th and 6th rows above the ventrals where the scales number 19; the 4th and 5th where the scales are 17. All these Fyzabad specimens had bright yellow underparts. I think these specimens may be taken to constitute a local variety.

All the specimens came from the neighbourhood of the river, 3 of them during flood on the 6th of August. The two smallest examples are evidently young of the year. I have arranged these specimens in tabular form as follows :—

Sex.	Length.	Tail.	Ventrals.	Subcaudals.	REMARKS.
♀	2′ 10¼″	7″	157	63	3 praefrontals, one median.
♀	11¾″	2⅜″	154	69	Last ventral divided. 13 ventrals between navel and anal.
♂	1′ 10″	6½″	147	81	The 35th, 36th, and 37th ventrals divided.
♂	1′ 9⅞″	6¾″	148	80	3 praefrontals, one median.
♀	2′ 1⅜″	5⅜″	156	58	Tail slightly docked.
♀	2′ 5″	6⅜″	151	66	
♂	9½″	2½″	145	80	7 supralabials on the right side, the 3rd and 4th touching the eye. 13 ventrals between the navel and the anal.
♀	2′ 0¼″	5⅜″	149	67	

Lycodon striatus.

I obtained 13 specimens. 7 of these were males, 4 females, and in 2 instances the sex was not noted. Two or three of these specimens were brought in alive and unhurt. They proved to be very timid, never attempting to bite when handled. They betrayed alarm by flattening their bodies on to the ground, and when molested buried their heads beneath coils. If after this exhibition of fear, one eye could still be discerned beneath the coil and an object was advanced towards it, by a brisk contortion the snake whisked its body round to shut out the danger from view. It was noticed, too, that frequently when handled the creature convoluted itself, and held itself rigidly so that it could be tossed into the air like a piece of knotted cane without disengaging its coils or relaxing its rigidity.

Breeding.—Two very interesting matrimonial incidents came to notice. On the evening of the 3rd of August 1906 a female was dislodged from a small heap of kunkur while the Club road was being remetalled. She proved to be gravid, and contained two eggs considerably advanced towards maturity. Early the next morning a male was dislodged from the same heap, and it would appear that these two were cohabiting.

More interesting still on the 14th August a boy brought me 3 eggs and a snake, and told me he had dug up the eggs, and that there were two snakes with them. One snake, the same as the one produced which was a male *striatus*, he said had escaped. Originally there were 4 eggs, one of which got broken. I inspected the spot, and found that this happy family party had been disturbed beneath the roots of an ixora bush some twelve inches or so beneath the soil. The story was corroborated by other coolies working at the same spot, and there is little doubt that these two were mates who had not dissolved partnership, though the fruits of their union had matured into eggs which had been discharged. This is quite in consonance with other records contained in my note books.

The eggs struck me as being very remarkably large. A length of one inch for an egg in a mother, herself less than 13 inches in length, which is what I measured the eggs *in abdomina* in the specimen of the 3rd August, is remarkable. The measurements of one of the 3 eggs laid, which were brought me on the 14th August, were $1\frac{6}{20} \times \frac{7}{20}''$.- They were all equally large.

Food.—It will be observed the food as in other Lycodons is mainly lacertine.

I have arranged the notes on these specimens in tabular form as follows:—

Date.	Sex.	Length.	Tail.	Ventrals.	Subcaudals	Remarks.
1904.						
2nd December ...	♂	1′ 0⅛″	2⅜″	168	50	Found in brickwork of well.
1905.						
21st April ...	♂	9¼″	1⅛″	163	47	Unearthed while digging. Seven upper labials, the 3rd and 4th only touching the eye. The tail of a skink, probably *Mabuia dissimilis*, in the stomach.
10th May ...	?	...	...	...	...	Much mutilated. Contained a skink (*Mabuia dissimilis*) in the stomach.

Date.		Sex.	Length.	Tail	Ventrals.	Subcaudals.	Remarks.
1905.							
20th July	...	♀	1′ 3½″	2¼″	179	45	Killed in the 85th K. S. L. I. Mess in the evening.
1906.							
23rd March	...	♂	1′ 0⅝″	2¼″	162	49	Labials seven, with the 3rd and 4th touching the eye.
8th July...	...	♀	1′ 0¼″	2″	172	45	Killed in Cantonment Hospital Ward.
3rd August	...	♀	1′ 1″	...	172	47	Contained a skink (*Mabuia Sp.*).
3rd August	...	♀	1′ 0⅞″	...	174	47	Dislodged from heap of kunkur. 7 upper labials on the right side; the 3rd, 4th and 5th touching the eye. Gravid. 2 eggs one inch long.
6th August	...	?	...	...	...	...	Escaped from captivity.
14th August	...	♂	1′ 1″	2⅜″	162	53	Unearthed with eggs while digging.
28th August	...	♂	...	...	...	...	Dislodged whilst digging.
29th August	...	♂	...	...	...	...	

Lycodon aulicus.

I obtained 35 specimens. Of the 32 sexed, 16 were males and 16 females. They were as numerous during the hot months as in the rains, and though scarcer they were not quite absent in the cold weather.

A large number were as usual caught in habitations.

Two cases of snakebite were traceable to this plucky and vivacious little snake.

It is worthy of remark that all but two of these specimens were adults, and in this respect it differed from most of the other species, and especially *Tropidonotus piscator.* (In the latter case large adults were in a very small minority.) Of 8 specimens that exceeded two feet in length only one was a male.

Food.—A mouse was taken on two occasions, and geckoes of the genus *Hemidactylus* furnished the meal in four other instances. The tail only of a skink (spec. *Mabuia* ?) had been swallowed by two examples.

Breeding.—A male and a female were caught together (not united) on the 9th of January in the bottle godown of the club. I found eggs *in abdomina* once in March, once in April, once in June, and three times in July, and obtained a hatchling 7⅜″ long in June. The number of eggs varied from 3 to 9.

Scale characters.—In no single instance was the anal entire. The contact of the præocular with the frontal though usual failed in several specimens. The upper labials (prone to more or less inconstancy in all species) were aberrant in some instances. They were 8 with the 3rd and 4th only touching the eye on the left side in one specimen, and 9 with the 4th and 5th only touching the eye on the left side in one specimen, and 9 with the 3rd, 4th, 5th and 6th, touching the eye on both sides in one specimen. The ventrals show a decided tendency to exceed those in southern examples. My records of these shields, however, are very imperfect.

♂	Ventrals	193 to 207.	Subcaudals	62 to 71.
♀	„	201 to 208	„	62 to 69.

In Cannanore they were as follows:—

♂	Ventrals	177 to 186.	Subcaudals	63 to 73.
♀	„	192 to 203	„	55 to 70.

Colour.—All the specimens were of one variety, which if one excludes the spotted or unspotted condition of the upper labials I would refer to Mr. Boulenger's variety D (Catalogue, Vol. I, 1893, p. 353). I do not think any attention should be paid to the labial spots. I find specimens otherwise identical in colour, and marks show the upper labials unspotted, and between this and the condition of large central brown spots there are individuals showing every gradation from a fine and sparse to a copious mottling of brown. Every specimen was barred with yellow, usually a pronounced canary yellow, but sometimes with a faint yellowish tinge, but never pure white.

Zamenis mucosus.

Of this common species I had 80 brought in to me. Of the 76 that were sexed, 43 were males and 33 females. They were most in evidence during the months of June, July and August, and in fact were scarce during the whole of the rest of the year.

Of specimens exceeding 6 feet 6 inches in length 22 were males and but one a female, which was 6 feet 7¼ inches long. 5 exceeded 7 feet, the largest taping 7 feet 5 inches.

It is curious that so many adults should have come in and so few young. Only 9 specimens were less than 4 feet long, and of these but 4 were less than 3 and none less than 2 feet.

A large specimen 6'-5¾" long was seen in broad daylight in conflict with a mongoose, near the Cantonment Magistrate's Court. Attention was drawn to the spot by the disturbance in the grass, and the combatants were pursued, the mongoose disappearing, but the snake passed from the frying pan into the fire.

Food.—Many specimens had recently fed, and their choice in diet was very varied. A single toad had been taken on four occasions, once the victim was *Cacopus systoma*, and thrice *Bufo andersonii.* A single frog furnished the meal twice, on both occasions *Rana tigrina.* Remains of frogs were found in another. One had swallowed 3 large chicks, two of which were in the stomach and one in the gullet, and the fledglings egrets judging from ingested shell. One contained a gecko *in gastro*, and had just seized and killed a fledgling in a bush. Another contained a frog and two toads (*Bufo andersonii*), and another glutton had dined on a young tortoise, a lizard of the genus *Calotes*, and a toad (*Bufo andersonii*).

Breeding.—In Vol. XVII of this Journal (pp. 267 and 273), I mentioned two incidents which occurred at Fyzabad which showed that pairs were cohabiting, and enjoying one another's companionship, though the female contained eggs in an advanced stage of development. I obtained 12 gravid females which contained eggs in various stages of maturity. One was captured on the 20th of June, ten in July, and one in August. The maximum number of eggs in a clutch was 16, and the minimum 8. A clutch of eggs obtained on the 8th of August, found with a parent snake, hatched on the 11th September. The details of this very interesting event formed the subject of a separate note in this Journal (Vol. XVII, p. 1033).

Scale characters.—It is interesting to note the variation in the range of the ventrals, and subcaudals, which occurs locally in the same species. I have already alluded to this in dealing with other species in this paper.

In this species there is a very noticeable tendency for the subcaudals in Fyzabad specimens to fall short of the number in Cannanore examples. My records, I regret to say, are rather meagre, but this tendency is marked, as will be seen from the following :—

Fyzabad.

8	♂	Ventrals	... 192 to 207.	Subcaudals	100 to 126
8	♀	,,	... 191 to 206	,,	108 to 115

Cannanore.

4	♂	Ventrals	.. 197 to 202.	Subcaudals	127 to 137
3	♀	,,	.. 192 to 196	,,	128 to 132

In Burma the subcaudals of 10 specimens in which the sexes are not recorded, were 102 to 119. A single specimen in Kashmir had 104, one in the Swat Valley 117. All these specimens (the only records available) conform to the Fyzabad range.

A specimen from Hakgalla in Ceylon had 134, and one in Trichinopoly 127 ; and these agree with the range given by the Cannanore examples.

Zamenis fasciolatus.

I obtained but a single small specimen of this uncommon snake in the month of July. It was alive, and probably a hatchling. It measured 11¼ inches, of which the tail accounted for 2¼ inches.

It was a very beautiful little creature showing much spirit and pluck. On irritation it erected itself and flattened the body after the manner of *Tropidonotus piscator*, and *stolatus*, which I thought peculiar in a species of this genus. The ventrals and subcaudals were 199+82 (the 2nd subcaudal entire). 20 ventrals were placed between the navel and the anal shield. The scales two heads lengths behind the head were 21, at mid body 23, and two heads lengths before the vent 17.

Simotes arnensis.

I obtained 16 examples. Of those sexed 8 were males, 7 females. One brought alive struck out at me repeatedly with open jaws, but in a very half-hearted way, for it never inflicted a bite. It flattened itself to the ground, and in this effort the quadrate bone must have been brought strongly into action ; for the neck, which at other times is not apparent, became prominently so by the broadening of the hind part of the head.

Another live one I played with, and tried to get to strike, but it objected to facing my hand, or my handkerchief, and refused to menace. When I drummed my fingers on the floor in front, it turned and endeavoured to escape. It inflated its body in a peculiar manner. It did so to a very marked extent, preserving the contour of its body in the effort. One could feel the resiliency offered by the column of air within, and this was abruptly defined at the 13th cross bar. Subsequently on dissecting the snake the lung was found to extend to the 11th cross bar only, so that the inflating effort may be judged from this to be considerable. Whilst trying to catch it by the neck it very cleverly evaded my dashes at it, but without attempting to bite me, but when I had got hold of its neck it somehow made a vigorous twist and buried its teeth into the soft of my thumb, producing two lacerations, the pattern of which I reproduce here. These bled freely.

Scale characters.—One specimen had the anal shield entire. Two others had fragments detached from the parietals, which some might call temporals. This last abnormality I am familiar with in other species of this genus. In one example the loreal was absent. All the specimens had the under parts unspotted, and thus conformed to Mr. Boulenger's variety A (Catalogue, Vol. I, 1894, p. 230).

The cross bars were picked out with white or buff, and in one instance at least were indented in the median line in front, and behind so as to be nearly bisected.

The trisaggitate marks on the head were not connected by a median shaft as so commonly occurs in other species of the genus.

Food.—None had recently fed.

Breeding.—On the 22nd August two specimens were brought in, reported to have been climbing the same wall at the same time, and about two yards apart. They proved to be male and female. In the latter's abdomen I found four imperfectly developed eggs, two in each ovary. Two of these measured $\frac{9}{20}$ of an inch, and the others $\frac{12}{20}$ of an inch. One small and one large one in each ovary. The disparity in size suggested the possibility of superfœtation.

Another captured on the 18th August contained 5 eggs *in abdomina*, $1\frac{8}{20}$ inches long by $\frac{7}{20}$ of an inch broad.

Two specimens, which appeared to be hatchlings, were obtained in April, but I have little hesitation in supposing these to be last year's progeny after hibernation. In temperate climates I have on other occasions in the early spring found snakes little, if at all, larger than at the time of their production late in the autumn months. Fyzabad is blessed with an excellent cold season.

I show these specimens in tabular form :—

Date.	Sex.	Length.	Tail.	Ventrals.	Subcaudals.	REMARKS.
1905.						
22nd April	♂	6⅝″	1″	180	53	Killed inside house at night.
2nd May	♀	7¾″	¾″	186	46	19 ventrals between navel and anal.
1st October	♂	1′ 4½″	2⅞″	176	54	Anal entire. Killed in a well.
3rd October	♂	1′ 4½″	2¼″	172	50	
23rd March	♂	1′ 2⅓″	2½″	177	55	Detached fragment of parietal forms a pseudo temporal.
1906.						
29th March	♀	1′ 3¼″	2¼″	192	45	
11th April	?	6½″	...	...	...	
16th July	♂	1′ 11½″	3⅞″	181	52	
17th July	♀	1′ 9½″	...	193	47	
18th July	♀	1′ 0¾″	...	193	45	
27th July	♂	1′ 11¾″	4⅝″	181	55	
11th August	♀	1′ 3¼″	2⅜″	195	50	
18th August	♀	2′ 0″	3¾″	187	50	Contained 5 eggs *in abdomina.*
20th August	♂	1′ 10¾″	4″	182	52	
22nd August	♂	1′ 10½″	4″	179	53	
Do.	♀	1′ 9¾″	3½″	189	50	Loreal absent on both sides. On the left the praefrontal meets the 2nd labial, on the right it fails to, and the post nasal touches the praeocular. A detached fragment of the parietal forms a pseudo temporal. Contained 4 eggs *in abdomina.*

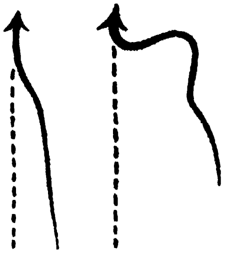
Hypsirhina sieboldii.

Of the 12 examples acquired, 8 were males, 3 females, and one was not sexed.

They were all captured during or subsequent to flood time in August. Nearly all were young of the year, at least ten being so. Whether the 12¾ inch specimen was so, is very doubtful, I am inclined to regard it as a second year specimen. There was only one adult. This is very probably due to the activity of this species, and would be better manifested by the adults which I know have great command of progress in the water.

Many of the young were brought alive, and their progress on land is remarkable. Instead of moving evenly forward by a series of bilateral undulations like most snakes, progress is effected by a unilateral effort, the body about its second quarter being thrust forward on one side. This done the head and body anterior to this fold are advanced, and the fold thus straightened, when a repetition of the act occurs, the fold being continually thrust forward on the same side. This curious manœuvre makes it appear that the snake is moving sideways as will be seen by the diagrammatic illustration attached (figure A).

FIG.—A.



If hustled, the vehemence with which the coil is thrown forward, makes progression appear to consist of a series of leaps, and I believe I was not mistaken in supposing that the effort was sometimes so vigorous that the body actually cleared the ground. If repeatedly irritated as by tapping the tail smartly, a game which amused me considerably, the little reptile would erect itself, poise with head averted and jaws open, exactly as a pup would do under similar circumstances in anticipation of he next blow, and the resemblance was so strong I almost expected to hear an accompanying warning growl. It strikes with great pluck and determination, and I had to be very smart to avoid being bitten.

Another specimen when not anticipating repeated blows, but acting on the defensive, lay closely crouched to the ground, especially in the hind part of the body. It then lay and dilated itself with its head on the ground retracted into a side loop touching the first coil of the body. When teased it struck upwards very fiercely, retracted the head almost instantaneously, and whisked its body round so as to lash with its tail, and then took up an exactly reverse position. A repetition after some time caused a reversion of the same manœuvre and the body then resumed its original position. This I have shown diagramatically (figure B).

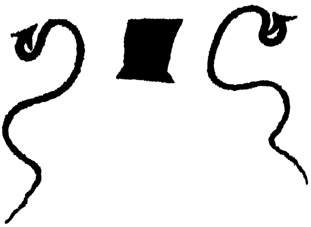


FIG.—B.

The physiognomy of the snake is unpleasant from the underhung condition of the lower jaw. Though the majority were caught in or beside the water, two at least were reported to have come into habitations. Many habitations though some distance from the river are connected by deep drains which in flood time would serve as conduits inland, and which after a subsidence would be cut off from the river, and might lead to overland excursions in the endeavour to regain their proper haunts.

Food.—One had swallowed a fish, and another a frog.

Breeding.—The season was evidently over, and the young by August already launched abroad.

Colour.—It is curious that in this snake the bars, which of course are developed independently on each side, nearly always fail to meet their corresponding fellows on the middle of the back; and in this respect it differs from other barred or banded snakes like the Bungarums and Lycodons where the failure to meet is quite unusual.

I append a table of the specimens.

Date.	Sex.	Length	Tail.	Ventrals.	Subcaudals.	Scales.			Remarks.
						2 heads lengths after head	Mid-body.	2 heads lengths before vent.	
1906.									
5th August ..	♂	8¾"	1⅝"	150	53	29	29	23	Killed in a house.
6th August ...	♀	9"	...	149	51	29	29	23	A frog swallowed.
Do. ...	♂	8¼"	1¼"	152	50	29	22	29	
7th August .	♀	1' 6⅝"	3"	150	51	29	30	25	
8th August ...	♂	9¾"	...	155	54	29	29	23	
10th August ..	♀	9⅜"	...	150	49	29	29	23	
11th August ...	♂	9"	...	152	54	29	29	21	23 ventrals between navel and anal.
17th August ...	♂	10⅛"	...	...	...	29	28	22	
18th August ..	♂	12¾"	...	148	?	...	..	...	30 ventrals between navel and anal.
24th August ...	...	10⅛"	...	...	...	...	...	...	A fish swallowed.
25th August ...	♂	9⅝"	...	...	...	...	...	...	Killed in a house.
27th August ...	♂	11"	1⅞"	155	55	29	29	23	Labials 9 on the right side, the 4th touching the eye, 7 on left side, the 3rd touching the eye.

Dipsadomorphus trigonatus.

15 specimens were brought in to me, 8 females, 5 males and the remaining 2 were not sexed.

Food.—The only one that had recently fed contained a lizard in the stomach, probably one of the genus *Calotes.*

Breeding.—3 females were found egg-bound in July and August.

The following is the detail of the specimens:—

Date.	Sex.	Length.	Tail.	Ventrals.	Subcaudals.	Remarks.
1905.						
15th May ...	♀	1′ 5⅛″	3¼″	222	84	22 ventrals between navel and anal.
6th July ...	♂	1′ 10½″	4″	211	84	
13th July ...	♂	1′ 3½″	2¾″	207	82	22 ventrals between navel and vent.
22nd July ...	♀	2′ 3½″	5″	226	82	
26th July ...	♀	2′ 2¾″	4¾″	224	83	6 eggs *in abdomina* $\frac{9}{20}$″ long.
11th October ...	♂	2′ 1¾″	5½″	218	90	
31st October ...	♀	2′ 3″	...	233	...	Tail docked.
1906.						
23rd June ...	♀	1′ 8⅜″	6¾″	218	78	
26th June ...	...	......	...	...	...	Much decomposed.
12th July ...	♂	2′ 0¾″	5″	...	...	Do.
22nd July ...	♀	2′ 6½″	...	222	77	2nd subcaudal entire. Only the 4th and 5th labials touch the eye.
23rd July ...	♂	1′ 8″	3⅞″	218	90	
25th July ...	...	......	...	...	...	Cut up by mowing machine.
1st August ...	♀	2′ 7″	6″	...	...	5 eggs *in abdomina,* $\frac{17}{20}$″ long. A lizard in stomach (*Calotes* sp.)
7th August ...	♀	1′ 10¼″	6¼″	229	76	3 eggs *in abdomina* $\frac{18}{20}$″ long.

Psammophis leithii.

I obtained a single specimen whilst encamped near Rae Bareilly. It was a female 2 feet 1¾ inches long, the tail 7½ inches. It was quite typical. The ventrals and subcaudals were 170+95. It had fed on a mouse. I have alluded to this specimen in a previous note in this Journal which extends the habitat previously recorded.*

Psammophis condanarus.

Of 23 specimens that came into my hands 16 were females, 6 males, and 1 was not sexed. The living examples were active, vivacious, and not backward in the use of their teeth.

The species appears to me to be subarboreal in habit.

Food.—One had eaten a frog, and two others a skink (*Mabuia* spec ?).

Breeding.—Two were reported to be found in company on the 27th of August, but one only, a female, was captured.

Scale characters.—The two last ventrals were bifid in one example. The labials were 9 with the 4th and 5th touching the eye in two specimens. I give a list in detail.

Date.	Sex.	Length.	Tail.	Ventrals.	Subcaudals.	Scales. 2 heads length after head	Scales. Midbody.	Scales. 2 heads length before vent.	Remarks.
1905.									
10th July ...	♀	...	...	174	84	17	17	13	
13th November.	♀	1′ 8¾″	5″	180	83	17	17	15	A skink eaten.
1906.									
21st March ...	♂	3′ 3⅝″	10⅝″	178	92	17	17	13	Labials 9 on right side, 5th and 6th touching the eye.
10th July ...	♀	2′ 5″	7¼″	185	87	17	17	13	
6th August ..	♀	1′ 7″	4⅝″	188	84	17	17	13	
Do. ...	♀	1′ ″	5⅛″	180	90	17	17	13	A skink *in gastro.*
Do. ...	♀	1′ 4⅜″	3⅞″	187	88	17	17	13	12 ventrals between the navel and anal shield.
7th August ..	...	...	...	...	...	...	...	...	Decomposed.
8th August ...	♀	2′ 6¾″	8¼″	176	88	17	17	13	
Do. ...	♀	2′ 4½″	5¼″	?	...	17	17	13	Tail imperfect.
11th August ...	♂	1′ 7½″	5″	180	92	17	17	13	Labials 9 on left side, the 5th and 6th touching the eye.

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* This appears on page 208 of this issue.

Date.	Sex.	Length.	Tail.	Ventrals.	Subcaudals.	Scales.			Remarks.
						2 heads length after head.	Midbody.	2 heads length before vent.	
1906.									
14th August ...	♀	2′ 3″	3½″	?	...	17	17	13	Tail imperfect.
Do. ...	♀	2′ 0½″	6″	...	...	17	17	13	
17th August ...	♀	1′ 10″	5⅜″	177	88	17	17	13	
Do. ...	♂	1′ 10½″	5⅝″	180	87 ?	17	17	13	Tail slightly imperfect.
18th August ...	♂	3′ 1″	8⅝″	177	82?	17	17	13	Do. do. do. Last two ventrals bifid.
Do. ...	♀	1′ 8⅝″	5¼″	180	87	17	17	13	
Do. ...	♀	2′ 6¼″	4″	180	?	17	17	13	Tail imperfect.
19th August ...	♂	1′ 2¾″	3½″	179	82	17	17	13	10 ventrals between navel and anal shield.
20th August ...	♀	3′ 2½″	9⅜″	180	85	17	17	13	A frog *in gastro*.
22nd August ...	♀	2′ 6½″	6⅜″	...	...	17	17	13	
27th August ...	♂	1′ 9¾″	8¼″	177	83	17	17	13	
Do. ...	♀	1′ 7⅛″	8″	...	...	...	...	...	Reported in company with another which escaped.

Bungarus walli.

This new species was figured and described in an earlier issue of this Journal (Vol. XVII, p. 608). I obtained 8 specimens.

Bungarus candidus.

Of 62 specimens 58 were sexed, 33 were males, and 25 females.

A large number were found in or about habitations and chiefly at night.

Food.—Young seem to rely upon the little blindsnakes (*Typhlops braminus*) for subsistence, but older examples though frequently ophiophagous exhibit very catholic tastes in the choice of food. Young mammals, toads, frogs, and once a young monitor lizard were devoured.

Breeding.—The young began hatching in July.

Scale characters.—In at least three specimens the 2nd supralabial was divided into an upper and a lower part.

Colour.—The vast majority of specimens were coal-black with the usual white linear arches over the back disposed in pairs, and most conspicuous in the latter half of the body.

Six examples were blackish-brown, calling to mind the coloured figure of this snake in Fayrer's work, which I had always considered a poor plate, and still think a misleading one, as this colour variety is distinctly rare. I never saw it before.

One specimen was coloured very peculiarly, the hue might be likened to that of dun as applied to a horse, otherwise as in the case of the brownish specimens, the white arches were typical of the common Indian variety. I append a detailed list of the specimens.

Date.	Sex.	Length.	Tail.	Ventrals.	Subcaudals.	REMARKS.
1905.						
?	♀	...	...	210	43	
20th April ...	♂	3′ 2¼″	5¼″	212	48	In lucerne bed by stables.
27th April ...	♂	2′ 9″	4½″	212	49	2nd supralabial divided (l).
23rd May ...	♂	3′ 8″	5⅜″	211	48	In deep well in the water.
26th June ...	♂	3′ 4″	5⅝″	211	49	Killed in stable at dawn.
6th July ...	♀	3′ 6″	5¼″	206	46	Killed by chowkidar in Cavalry Mess.
7th July ...	♀	2′ 1″	3½″	205	49	Seen, and caught on ceiling cloth.
Do. ...	♂	1′ 11½″	2⅞″	213	44	Stomach contained a frog.
13th July ...	♀	2′ 11⅛″	4¾″	211	49	
23rd July ..	♂	4′ 1¼″	6½″	207	48	
3rd October ...	♀	1′ 3⅜″	2″	201	48	In brickwork of well.
23rd October ...	♂	2′ 2″	....	...	...	
24th October ...	?	about 3′ 6″	...	...	...	In water in garden catchpit.
25th October ...	♂	2′ 8½″	...	..	...	Killed in Native Officers' Quarters, 8 p.m.
3rd November.	♂	3′ 6″	5⅜″	214	46	Killed in godown. A frog in stomach.

Date.	Sex.	Length.	Tail.	Ventrals.	Subcaudals	REMARKS.
1906.						
17th June ...	♂	2′ 3¼″	3⅛″	210	49	Killed in water in catchpit of garden.
21st June ...	♂	1′ 10¼″	3″	213	49	A young Varan (*V. flavescens*) *in gastro.* Brownish-black colour variety.
23rd June ...	♂	3′ 10″	6⅛″	211	50	2nd supralabial divided (¼). A toad (*Bufo andersonii*) in stomach. Killed in officer's bungalow at night.
28th June ...	♀	11½″	...	205	46	Killed outside officer's bath-room, 7 a.m
1st July ...	♀	3′ 6½″	...	...	...	Killed in house in Fyzabad City.
4th July ..	♀	1′ 11½″	3¼″	...	...	Killed in Fyzabad Club.
5th July ...	♀	2′ 3⅜″	3¼″	...	...	Killed in house in Artillery bazaar at night.
7th July ...	♀	3′ 0¼″	5⅛″	...	...	Killed in officer's kitchen at night. A musk rat (*Crocidura cœruleus*) in stomach. Peculiar light-coloured specimen. (Dun as applied to horse.)
Do. ...	♀	11¾″	1⅛″	...	...	Both found together in verandah of Civil Lines. Just hatched.
Do. ...	♀	11¾″	1½″	...	...	
9th July ..	♂	3′ 2½″	5″	208	46	Killed in verandah, Supply and Transport Lines. Brownish-black variety.
Do. ...	♂	1′ 8¾″	...	...	...	
11th July ..	♂	4′ 0⅛″	5⅜″	214	49	Killed in water in catchpit of Mess.
Do. ...	...	11⅜″	...	...	...	
17th July ...	♀	1′ 2¼″	...	...	...	
18th July ...	...	1′ 11¼″	...	...	...	Killed in Cantonment Hospital.
19th July ...	♂	3′ 3½″	...	...	...	Killed at night in Fyzabad City.

Date.	Sex.	Length.	Tail.	Ventrals.	Subcaudals.	REMARKS.
1906.						
19th July	♀	1′ 1½″	...	...	...	Killed in house. A blind snake (*Typhlops braminus*) 3¾″ lying full length in the stomach.
Do.	♀	1 1⅛″	...	...	...	Killed within two yards of last.
20th July	...	1′ 1¾″	...	...	...	Killed close to where the last two were killed. A small callow young mammal in stomach (shrew ?).
21st July	♀	1′ 0″	...	...	...	
22nd July	♂	1′ 1⅛″	...	...	...	A *Typhlops braminus*, 4¼″ long, in stomach. Killed in servant's house.
23rd July	♀	1′ 1¾″	...	...	...	A *Typhlops braminus*, 2¼″ long, in stomach. Killed in a house in city.
24th July	♂	3′ 9½″	...	...	...	Killed in officer's stables at dawn.
25th July	♂	1′ 2½″	...	...	...	Killed in R. A. Mess. Two small *Typhlops braminus* and a small frog in stomach.
Do.	♀	3′ 2¾″	...	...	...	Killed in servant's godown.
27th July	♂	3′ 7¼″	...	...	...	Killed in compound in Civil Lines. A brownish-black variety.
Do.	♂	2′ 10″	...	...	...	Killed in house. A toad (*Bufo andersonii*) in the stomach.
28th July	♀	1′ 11½″	...	...	...	Killed in Police Officer's house. Two snakes (*Typhlops braminus*), 4⅛″ and 5¼″ long. Lay fully extended in stomach.
Do.	♂	1′ 1″	...	...	...	A snake (*Typhlops braminus*) in stomach.
31st July	♂	3′ 0¼″	...	...	...	Killed in village house. The bones and hair of a mammal in the stomach.
Do.	♂	1′ 11¼″	...	...	...	
1st August	♀	3′ 7¾″	...	...	...	

Date.	Sex.	Length.	Tail.	Ventrals.	Subcaudals.	Remarks.
1906.						
2nd August ...	♂	4′ 0″	...	...	...	Killed on entering a house. The stomach contained the scales of a snake, and the extreme 2 inches of the tail tip being undigested permitted me to identify it as another krait (*B. walli*).
6th August ...	♀	1′ 11¾″	...	...	...	
Do. ...	♀	1′ 7¼″	...	...	...	
7th August ...	♂	3′ 7″	...	...	..	
8th August ...	♂	3′ 5″	...	...	...	Killed in a house.
9th August ...	♂	4′ 4¾″	...	...	...	Reported found in a tree ; the height indicated about 20 feet.
10th August ...	♂	3′ 7″	...	...	...	Brownish-black colour variety. 2nd supralabial divided (½).
11th August ...	♀	2′ 6″	...	...	...	
18th August ...	♂	2′ 6″	...	...	...	
19th August ...	♂	3′ 7″	...	...	...	
23rd August ...	♂	2′ 8¼″	...	...	...	Brownish-black colour variety. Killed in Saddar Bazaar. The stomach contained 6 blind and callow young mice.
Do. ...	♀	1′ 5¼″	...	...	...	
28th August ...	♂	2′ 8¼″	...	...	...	Brownish-black colour variety.
29th August ...	♀	2′ 10¾″	...	...	...	

Naia tripudians.

Of 39 specimens that came into my hands, 19 were males, 17 females, and 3 were not sexed.

During the hot weather a cobra got into a quailery at night. 13 quails were found dead scattered about the floor in the morning and a cobra was found in the enclosure with a quail in its stomach.

The cobra brought to me on the 7th August 1906 was captured under somewhat amusing and novel circumstances. On the night of the 5th August it came into a native house, found its way into a hen coop, and killed the hen and six chickens. Three of the latter it ate,

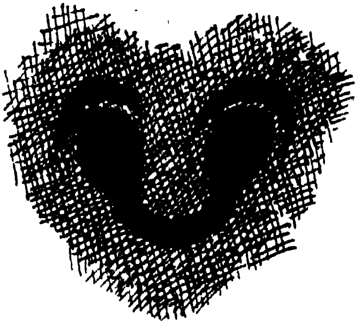

Fig. 1.

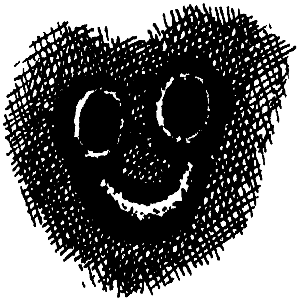

Fig. 2.

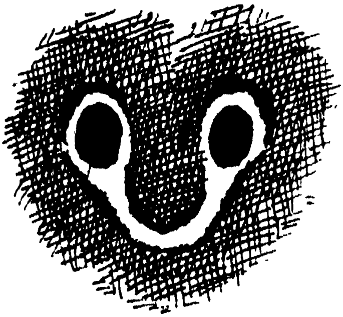

Fig. 3.

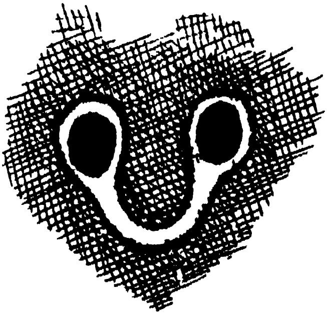

Fig. 4.

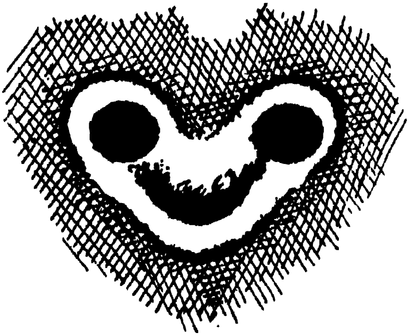

Fig. 5.

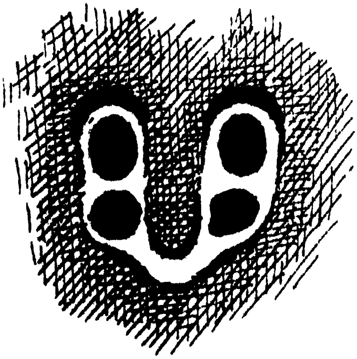

Fig. 6.

F. WALL, DEL.

VARIATIONS IN THE MARKINGS OF THE HOODS OF COBRAS.

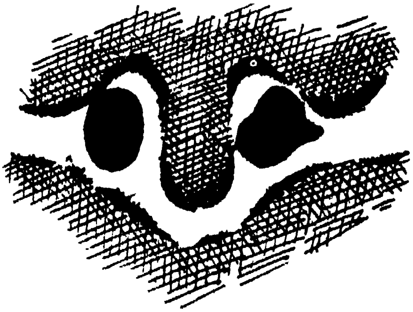

Fig. 7.

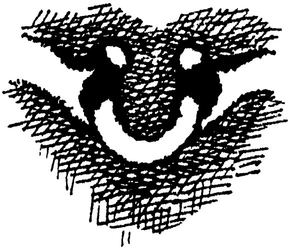

Fig. 8.

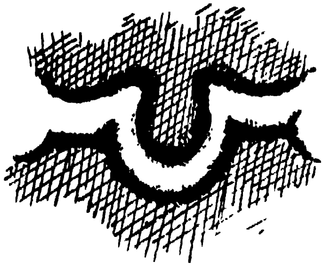

Fig. 9.

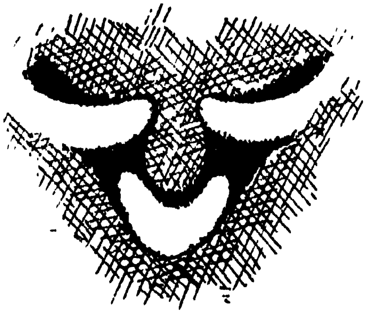

Fig. 10.

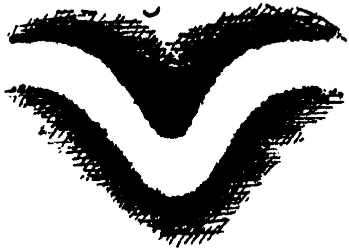

Fig. 11.

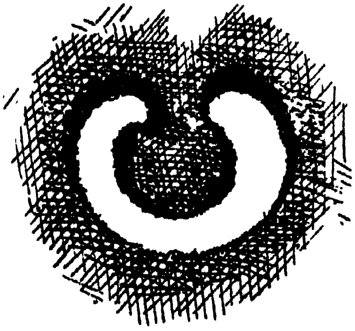

Fig. 12.

F. WALL, DEL.

VARIATIONS IN THE MARKINGS OF THE HOODS OF COBRAS.

and subsequently disgorged I am told. The incensed household agreed to sit up on the night of the 6th and had a fish hook baited with a frog to tempt it. About 3 a.m. the cobra emerged, tackled and swallowed the frog to the great satisfaction of the revenge-seeking inmates of the house who promptly despatched it. When brought to me, and cut open, sure enough a large frog was in the stomach still attached to a fish hook that would have held a mugger, and the line was issuing from the snake's mouth.

Breeding.—I obtained no gravid females, but young were hatching in July.

Food.—Rats were frequently taken, but toads and frogs also.

Colour.—The most striking point of interest to me was the variation exhibited by the specimens in colour and especially in hood markings. Most of the specimens I placed in Mr. Boulenger's Category "A a" (Catalogue, 1896, Vol. III, p. 381). It will be seen, however, that many of the specimens were so peculiarly marked that the scheme laid down in that authority's work made it impossible to know with which to include them.

Every amateur photographer of many in cantonments had his camera out of order whenever I got a specimen I wanted to take a faithful record of. I have, however, roughly sketched the hood marks of many as they came in, and these I hope will be of some use in showing their great variation.

In addition I give other details in tabular form of the specimens.

Date.	Sex.	Length.	Tail.	Ventrals.	Subcaudals.	Scales.			Prevailing colour.	Remarks.
						2 heads lengths behind head.	Midbody.	2 heads lengths before vent.		
1905.										
... ..	♂	...	...	189	60	23	21	15	Wheat....	Hood marks as in fig. 10.
... ..	♀	4′ 1½″	?	...	...	26	21	15	Blackish.	Tail docked. A large rat in stomach. Hood marks as in fig. 5.
... ..	♀	2′ 0¼″	4½″	193	58	?	23	15	Do.	Lower temporal touches 5th, 6th and 7th supralabials.

Date.	Sex.	Length.	Tail.	Ventrals.	Subcaudals.	Scales.			Prevailing colour.	Remarks.
						2 heads lengths behind head.	Midbody.	2 heads lengths before vent.		
1905.										
......	♂	3′ 0″	6⅛″	188	64	25	21	15	Mottled dun.	Found attacking a myna's nest. Hood marks as in fig. 2.
26th June ...	♂	4′ 2½″	7¾″	187	59	25	23	15	Black mottled.	Hood marks very obscure.
27th July ...	♂	2′ 6⅛″	4⅞″	187	55	25	23	15	Black & dun.	
1st July ...	♂	2′ 5¾″	...	184	60	25	23	15	Light plumbeous.	Hood marks as in fig. 9.
2nd July ...	♂	3′ 10″	...	184	58	24	23	15	Dun.	
21st July ...	♀	4′ 1″	...	188	55	25	23	15	Blackish.	A rat in the stomach.
24th July ...	♂	3′ 8″	...	...	...	25	23	15	Do. ...	Hood marks as in fig. 12.
26th July ...	♀	3′ 9″	...	193	55	25	23	15	Do.	
6th October...	♂	4′ 4″	...	187	59	25	23	15	Black ...	A very indistinct binocellus, with no white marks.
20th November	♂	2′ 3″	...	191	58	25	23	15	Khaki ...	Hood marks as in fig. 12.
1906.										
21st June ...	♀	3′ 10″	...	189	59	...	...	...	Black ...	Binocellus very obscurely suggested.
26th June ...	♀	3′ 0½″	...	...	...	...	...	...	Do. ...	A toad (*Bufo andersonii*) in the stomach.
27th June ...	♂	3′ 10¼″	...	176	42	23	23	15	Wheat...	Tail docked. Hood marks almost identical with fig. 9.
30th June ...	♀	4′ 0⅝″	8⅜″	...	...	23	21	15	Black ...	Indistinct but perfect binocellus. A very large rat in the stomach.
3rd July ...	♀	4′ 5″	8½″	...	...	25	21	14	Do. ...	Two ocelli with imperfect black delineation around.

Date.	Sex.	Length.	Tail.	Ventrals.	Subcaudals.	Scales.			Prevailing colour.	Remarks.
						2 heads lengths behind heads.	Midbody.	2 heads lengths before vent.		
1906.										
8th July ...	♀	4' 9½"	8¾"	...	...	27	23	15	Black ..	Ocelli with well-defined white spectacle though not outlined black.
10th July ...	♀	4' 5¼"	8¼"	...	...	27	23	15	Blackish.	Binocellus as in fig. 1.
12th July ...	♀	4' 1"	7½"	...	...	27	23	15	Do.	Do. A toad (*Bufo andersonii*) in stomach.
15th July ...	♀	3' 7¾"	7¼"	...	...	23	21	15	Do.	Hood marks as in fig. 1 but without the two black arcs over the ocelli. Two toads (*Bufo andersonii*) in stomach. One swallowed breach first.
Do. ...	♂	4' 1¾"	...	...	...	27	23	15	Do.	Hood marks as in fig. 11.
17th July ...	...	1' 0¾"	...	...	...	23	21	15	Pale khaki.	Hood marks as in fig. 8.
19th July ...	...	11' ½"	...	...	...	..	...	...	Do.	
26th July ...	♀	4' 3"	...	...	...	25	21	15	Black ...	A large rat in stomach.
30th July ...	♀	4' 3"	...	...	...	25	22	15	Do. ...	Hood marks as in fig. 1. A rat in stomach.
31st July ...	♂	3' 6"	...	...	...	25	22	15	Blackish.	Very perfect binocellus, see fig. 4.
Do. ...	...	12' ½"	...	...	...	...	...	.	Dark khaki.	Hood marks like last.
4th August ...	♂	3' 1¼"	...	...	...	...	...	...	Blackish brown.	Hood marks as in fig. 4.
Do. ...	♂	3' 9¾"	...	...	...	25	21	15	Blackish.	A rat in the stomach.
7th August ...	♂	3' 9"	...	...	...	21?	21	15	Do.	Hood marks as in fig. 6.
13th August ...	♂	4' 0"	...	...	...	..	...	...	Do.	Well-defined binocellus (fig. 4).
14th August ...	♀	1' 2¾"	2¼"	...	...	23	23	15	Khaki.	Almost perfect binocellus (fig. 3).
17th August ...	♂	1' 1¾"	...	...	...	23	21	15	Do.	Hood marks like last.
19th August ...	♀	4' 9½"	9½"	...	...	?	23	15	Black ...	Binocellus very obscure.
20th August ...	♂	3' 10"	7"	...	...	23	21	15	Mouse colour.	Hood marks as in fig. 7.
Do. ...	♀	4' 1"	8"	...	...	23	21	15	Blackish.	Hood marks as in fig. 8. These two were killed in the roof of a house close together.
23rd August ...	♂	4' 4"	8½"	...	...	27	23	15	Stone colour.	Hood marks as in fig. 3.

ON A NEW GENUS AND SOME NEW SPECIES OF ACULEATE HYMENOPTERA COLLECTED BY LIEUT.-COL. C. G. NURSE IN BALUCHISTAN.

BY

P. CAMERON.

(*Continued from page* 1012 *of Vol. XVII.*)

ANTHOPHILA.

Plesiopanurgus, gen. nov.

Radial cellule reaching to the base of the apical third of the space between the stigma and apex; apex of radius oblique, rounded. Stigma not much thicker than the costal nervure, sharply pointed at the apex. 1st abscissa of cubitus nearly as long as the 2nd; the recurrent nervures distant from the transverse cubitals. Trophi long—longer than the head and thorax united; labial palpi 4-jointed; the 1st joint not quite so long as the 2nd; the 3rd distinctly shorter than the 1st; the 4th minute; ocelli in a curve, the middle placed very shortly in front of lateral. Eyes large, reaching to base of mandibles. Labrum large, broadly depressed in the centre, the apex raised. Mandibles long, edentate; calcaria and claws simple. Pubescence dense, much denser and longer in the ♂ than in the ♀; the abdomen in the latter without distinct hair fringes above, the apical segments densely covered with long hair; the pygidium bare, triangular. The pubescence on the ♂ is much longer and denser all over than it is in the ♀, but more especially on the legs and abdomen; it is also larger, more stoutly built, the head also being larger and wider; structurally it differs in the sides of the pronotum forming a large, oblique projection, narrow at the top, becoming widened gradually below. The antennæ are very different structurally in the ♂ from what they are in the ♀; the scape is much stouter, swollen, of almost equal width throughout, about 3 times longer than thick; the last joint is longish, broad at the base, becoming abruptly narrowed on the apical half, into a narrowed, cylindrical, slightly curved projection; the scape is almost double the thickness of the flagellum. The penultimate ventral segment at apex is raised semicircularly in the middle at the base. The sides of the metanotum in the ♂ form a broad semicircular projection; the ♀ has them rounded gradually from the top to the bottom. If the sexes of the species here described are correctly united, then the ♂ is much larger, stouter and has a much larger and wider head than the ♀, the head in the latter not being wider than the thorax. The eyes in the ♂ are more distinctly narrowed above than they are in the ♀.

This genus belongs to the *Panurgidæ*, a group new to the Indian Fauna. The ♂ may be easily known by the peculiar form of the antennæ and of the prothorax. In the tables of Ashmead the genus comes close to *Panurgus* (Trans. Am. Ent. Soc. XXV., p. 85) which has the 1st joint of the labial palpi much longer, the last being also longer, being nearly as long as the following 3 united, the claws are cleft, and the antennal scape in the ♂ is not greatly thickened, nor the last joint greatly narrowed.

Plesiopanurgus cinerarius, sp. nov.

Black, the pubescence cinereous, almost white in the ♂; the head closely punctured, the clypeus more strongly and less closely than the front and vertex; these are more strongly punctured in the centre than the sides; the depressed centre of labrum closely longitudinally striated. Thorax opaque, closely punctured, the metathorax more strongly than the rest, the punctures in the centre of metanotum running into reticulations; the abdomen is more shining, much more finely punctured, with the apices of the segments smooth; the pygidium bare, opaque, impunctate, the hair surrounding it reddish. Calcaria and the long hairs on the metatarsus black Wings clear hyaline, nervures and stigma black. Tegulæ moderately large, black to piceous. The metanotum in the ♂ is more distinctly reticulated all over. The hair all over is longer and denser than it is in the ♀, but more especially on the head and metanotum; that on the ♀, however, may be rubbed off. ♀ and ♂.

Length ♀ 8 mm.; ♂ 9 mm.

The face in the ♂ is broadly raised in the centre, reminding one of *Lithurgus*; the head is larger and broader, apart from the longer hair giving it a broader appearance. The base of the metatarsus in both sexes is narrower than the apex of the tibiæ. The anterior spur is curved, the apex narrowed, with a short spine at the base. The antennæ in both sexes are short.

Taken at Quetta, Baluchistan, by Lieut.-Col. Nurse, who is satisfied that the specimens I have described are the sexes of one species.

DIPLOPTERA.

Polistes gallicus, Linn.

Black, with the following yellowish orange markings; clypeus, mark at base of mandibles, 2 small marks at the end of the antennal keel, a mark, narrowed in the middle, at the eyes, between the antennæ and clypeus a curved mark, narrowed gradually laterally over the antennæ, a broad line on the upper half of the eye orbits, a line in the centre of pronotum, broadly dilated on the basal half of propleuræ and continued as a narrow, irregular line along the top of pronotum, tegulæ, a large conical spot below them, 2 short lines in centre of mesonotum, 2 spots (sometimes united) on basal half of scutellum, the outer side the longer, a spot on the outer side of post-scutellum, a large triangular spot on the sides of metanotum, the outer side more rounded than the inner, the top with an irregular incision, a small triangular spot in front of hind coxæ, the apex of 1st abdominal segment broadly, the base in the centre with a triangular incision, the apical two-thirds of the 2nd, the centre at the base with a large triangular incision, trilobate at the apex, and the apices of the others, except for broad black bands, trilobate at the apex, and the apices of the 2nd and following ventral segments (the apices of the black bands trilobate) and the apices of the femora, the tibiæ and the tarsi orange yellow, the apices of the latter 3 tinged with fulvous-orange. Antennæ reddish orange, the scape black above, yellow below. Wings fuscous-hyaline, the costa and stigma reddish fulvous, the nervures black. ♀

Total length 14 mm.

Quetta. March, April and May.

Clypeus smooth, slightly but distinctly longer than broad, the apex broadly rounded. Malar space distinct, twice the length of the antennal scape. Temples nearly as long as the top of the eyes, roundly narrowed. Occiput only thinly margined on upper half. Head, pro- and mesonotum without a distinct puncturation; the propleuræ finely closely striated. Ocelli in a triangle, the hinder separated from the eyes by double the distance they are from each other. The yellow colour is paler than with any European specimen I have seen.

As the specimens taken by Col. Nurse are uniform in colouration, I have given a description of them, as they may form a local race. The species is found at the opposite end of the Himalayas at Gilgit. The chief distinction, as compared with normal examples, lies in the much greater extension of the yellow on the pro- and metanotum.

Eumenes affinissima, Saus., race *quettaensis*, n.

An *Eumenes* taken at Quetta from May to July appears to form a distinct race of *affinissima* or of *promiformis*; if *affinissma* is not distinct from the latter. The Quetta race has a total length of 13 mm.; its head, thorax and abdominal petiole are densely covered with long pale hair, the 2nd segment with pale pile. The following marks are bright yellow: clypeus, apex of labrum, underside of antennal scape, antennal, keel (it is wide and long), a short narrow line behind the eyes, the base of pronotum, the mark occupying the basal half of the sides of pleuræ, a conical mark below the tegulæ, tegulæ, basal half of scutellum, the mark varying in size and united or divided, post-scutellum, sides of metanotum broadly, 2 small marks beyond the middle of petiole, a line on its apex, a large oblique, broad spot on the sides of the 2nd segment at the base, a broad band on its apex, broadly, roundly dilated in the centre, and with an incision, dilated at the apex, in its centre, the apices of the other segments broadly (the black basal bands with 3 dilatations), a greater or a smaller, somewhat semicircular mark on the apex of the 2nd ventral and the apices of the others. Puncturation strong and close; the 1st abdominal segment is coarsely closely punctured above, the sides are more shining and only weakly, sparsely punctured; the 2nd is closely less strongly, more uniformly punctured; its apex is slightly broadly depressed. The black part of the 2nd segment may have, in the centre, a short triangular projection, with a separated black spot near the apex; or this spot may be united to the basal projection. Clypeus slightly longer than wide, its apex with a distinct, but not very deep rounded, incision. Sides of metanotum broadly rounded, the central furrow shallow; the apex of post-scutellum gradually broadly rounded.

I have not a typical example of *affinissima* for comparison, but as regards *punctatus*, Sauss, apart from the difference in colouration, there is a well marked difference in the form of the post-scutellum: in *punctatus* it forms a broad triangle, *i.e.*, its apex becomes gradually, obliquely narrowed to a point in the centre; in the present form it is broadly rounded, not narrowed to a point.

Odynerus (*Ancistrocerus*) *leucospilus*, sp. nov.

Black, the clypeus, mandibles except the teeth, a large frontal mark, narrowed below, its length more than the width at the top, a broad line on the lower part of the eye orbits, underside of antennal scape, a broad line on the upper two-thirds of the eye orbits, a broad mark on the pronotum, leaving a triangular black mark on the apex, a broad mark, transverse above, rounded below, under the tegulæ, almost touching them, tegulæ, basal three-fourths of scutellum, sides of metanotum broadly, a mark on the basal three-fourths of the 1st abdominal segment, in the centre; its apex widened slightly and irregularly, the central part slightly incised, the sides projecting, the 2nd, except for a large trilobate black mark in the centre of the basal three-fourths, the basal to be smaller and narrower than the lateral, a line on the base of the following segments, the last entirely, and spots on the sides of the 3rd, 4th and 5th and the 6th ventral segment entirely, black, the rest of the abdomen pale yellow, almost white. Legs pale yellow, the femora 4 above and the tarsi rufous. Underside of antennal scape pale yellow, of the flagellum rufescent. Wings clear hyaline, the nervures black, the stigma brown. ♀.

Total length 9 mm.

Quetta. July.

A broad, stout species, closely, strongly punctured and covered with a short white pile. Clypeus broader than long, its apex slightly roundly incised. Base of thorax transverse. Post-scutellum projecting as a ridge over the metanotum, its apex rough, transverse, its sides bordered by a narrow keel. Metanotum with a steep slope, its sides rounded, with a short, but distinct, conical tooth below the middle. First abdominal segment cup-shaped, the 2nd not much wider than long, not narrowed at the base, the apex slightly, narrowly depressed. There are 2 distinct furrows on the apex of mesonotum.

Odynerus (*Ancistrocerus*) *quettaensis*, sp. nov.

Length 8 mm. ♀.

Quetta. July.

This species is very similar to the foregoing; the differences between them may be expressed thus:—

Colour pallid yellow, post-scutellum immaculate, sides of metanotum spinose, the mark on 1st abdominal segment wider at the apex than at the base, the mark on 2nd abdominal segment not triangular .... *leucospilus*.

Colour bright lemon-yellow, post-scutellum maculate, sides of metanotum not spinose, the mark on 1st abdominal segment widest at the base, the mark on the 2nd triangular ...*quettaensis*.

Frontal mark triangular, longer than it is wide at the top; the mark in eye incision widened above, with a short projection on the outerside. Clypeus broader than long, the apical incision shallow, but distinct. There is a longish, narrower mark below the upper pleural mark, it issuing from the apex of the latter and is a little longer than it. Parapsidal furrows deep. Apex of post-scutellum margined, its centre slightly projecting, a little curved inwardly; the sides depressed, margined on outer edge, its apex transverse. Sides of metanotum rounded, broad and smooth above. The mark on the 1st abdominal segment is in 3 parts, the basal broader than the middle, the middle than the apical, which is almost square. The black mark on the 2nd segment at the base forms a broad triangle longer than the transverse apical part to which it is united by a short projection; the apical part broad, curved, roundly, broadly incurved in the middle of the apex; its outer edges reach close to outer side of the segment. The 2nd segment is almost square, its apex with a furrow, beyond which it is slightly recurved. Antennal scape yellow except slightly above and below at the apex, the flagellum brownish below. Wings clear hyaline, the nervures and stigma black.

Odynerus (Ancistrocerus) baluchistanensis, n. sp.

Black, a triangular mark on the front, a triangular one filling the eye-incision, a longish mark behind the eyes, a mark on base of pronotum, not reaching to the middle, tegulæ, an oval spot below them, a transverse mark on apical half of scutellum, divided by a furrow, sides of metanotum broadly, the apices of the abdominal segments broadly, the black on 2nd segment with a broad, curved, somewhat oval incision, and the ventral segments for the greater part bright lemon-yellow; the basal abdominal segment entirely, the 2nd with a large black mark of which the base extends from side to side, the apical (and larger) part narrower and rounded at the apex; the other segments (except the last, which is entirely black) with trilobate black lines. Legs lemon-yellow, the femora black above at the base; wings hyaline, the nervures and stigma black. ♂ and ♀.

Total length 6 mm.

Quetta. June.

Strongly punctured. Clypeus clearly broader than long, the apex distinctly roundly incised. Base of thorax transverse. Apex of post-scutellum broadly rounded. Sides of metanotum with serrated edges, a longish spine below. 2nd abdominal segment longer than it is wide at the apex, which is strongly recurved.

The ♂ is similar, but with the yellow more extended, *e. g.*, the lower half of the front is entirely yellow, the black mark on the top of the 1st and on the 2nd ventral segment is smaller, the scutellum is entirely yellow; antennal scape entirely and the base of flagellum below are yellow, mandibles entirely yellow.

SCOLIIDÆ.

Plesia baluchistanensis, sp. nov.

Black, shining, the head and thorax strongly, the basal half of the abdominal segments less strongly and closely punctured, the head, thorax and femora densely covered with long white pubescence, the abdomen with shorter white pubescence, the clypeus, mandibles, except at apex, prothorax, except the sternum and apical half of propleuræ, a mark wider than long, triangularly incised on basal half on mesonotum, scutellum, 2 spots on apex of post-scutellum, a large, triangular mark on mesopleuræ, nearer the base than apex, a broad band on the apex of 1st abandominal segment, squarely, broadly dilated laterally and with an incision at the base, the narrowed middle part slightly dilated in the middle, broad bands, dilated laterally, except the last, and narrower bands on ventral segments 2-6, bright yellow. Legs similarly coloured, the trochanters, base of femora above and a broad line on the outer side of the hind tibiæ, black. Wings clearly hyaline throughout, the nervures black, the stigma brown; the 2nd abscissa of radius fully one-fourth longer than the 3rd, the 2nd and 3rd abscissæ of cubitus about equal in length; the 1st recurrent nervure is received at the base of the apical fourth, the 2nd at the apex of the basal 3rd. Antennæ stout, not tapering towards the apex, as long as the head, thorax and basal segment of abdomen united; black, except for a small yellow spot on apex of scape. ♂.

Length 12-14 mm.

Quetta. May to July; very common.

Temples roundly narrowed. Basal third of abdominal petiole greatly narrowed as compared with the enlarged apex, which is longish cup-shaped; the 2nd to 5th segments are of equal width, the apical slightly narrowed. The hair on the metathorax is longer and denser than elsewhere; it is opaque, alutaceous. The black bands on 2nd and 3rd segments are of equal width, the central are rounded, narrowed laterally. Apical slope of metanotum transverse. Clypeus broad, rather strongly punctured, the apex with a slight, shallow incision, the sides at apex oblique.

Smith describes a *P. orientalis* from Baluchistan; taking Bingham's description of it (Hym. of Brit. India, I, 69) it should be separated from my species as follows:

"Punctures light and inconspicuous," "antennæ very long and filiform;" pleuræ immaculate, "centre of scutellum orange yellow;" nervures dark testaceous .. .. *orientalis.*

Punctures strong and conspicuous, antennæ not very long, stout, pleuræ with a large triangular mark, nervures black, scutellum entirely yellow ... ... *baluchistanensis.*

Plesia subpetiolatus, sp. nov.

Black, mandibles except at apex, a narrow line on apex of pronotum, lines, dilated laterally, on the apices of the basal 4 abdominal segments, 3 broad lines on the 5th, 3 shorter ones on the 6th, the apex of femora, the tibiæ, except broadly below and the tarsi, pale yellow; wings clear hyaline, the stigma brown, the nervures darker, almost black, the 2nd and 3rd abscissæ of radius almos equal in length, the 2nd abscissa of cubitus less than one-fourth longer than the 3rd; the 1st recurrent nervure received shortly, but distinctly beyond the middle, the 2nd near the apex of the basal third of the cellule. ♂

Length 9 mm.

Quetta; common from May to August.

Head and thorax densely, the abdomen more sparsely covered with white pubescence. Puncturation on head and thorax strong and close, on the abdomen weaker and less close. Antennæ stout, longer than the head and thorax united, not tapering towards the apex. Temples not quite so long as the eyes above, straight, obliquely narrowed, occiput quite transverse. Base of prothorax transverse, not much narrowed. Apex of metanotum transverse, the sides broadly rounded. First abdominal segment broad, cupshaped, the narrowed basal part short, the whole segment hardly longer than the 2nd.

Characteristic of this species is the short, almost sessile 1st abdominal segment; the base and apex, too, of the thorax are more transverse than usual, than in *e. g. P. petiolata* which it resembles somewhat in colouration.

Scolia quettaensis, sp. nov.

Ferruginous, densely covered with stiff ferruginous pubescence. The front, vertex, inner half of the upper outer orbits, and the 3rd and 4th abdominal segments above pale orange; wings fulvous tinged with red, the apex fuscous violaceous, the fuscous colour commencing at the apical transverse cubital nervure and extending backwards to the recurrent nervure; the ♂ has the 4th abdominal segment orange, as well as a broad line on the pronotum. The vertex and front are not entirely orange, there being a black line across the ocelli from eye to eye, this line being roundly dilated in the middle in front; and the lower part of the occiput is rufous; the reddish colour is largely suffused with black, and the basal abdominal segments have the apical halves black; the orange fulvous colour in the wings is much less extended, it being only present in the radial and the apical half of the costal cellules. The antennæ are of a brighter red colour than the body.

Length ♀ 22 mm.; ♂ 15.

Quetta, May to August; common.

Vertex smooth, the front strongly, but not closely punctured. Mandibles black, dark red below. Thorax closely, somewhat closely punctured, the centre of mesonotum and the pro- and mesopleuræ, the latter and the metapleuræ at their junction below, smooth. Abdomen sparsely, weakly punctured; the segmental fringes and the pile on pygidum ferruginous. Tibial and tarsal spines and the hairs on the legs ferruginous.

The ♂ is darker coloured than the ♀, the red being largely suffused with black, the hair also being darker shading off into fuscous in places; there is an orange mark on the sides of the 3rd and 4th ventral segments.

Allied to *S. erythrocephala*, F. and *S. flaviceps*, Eversm. In these species the hair is black, not red. In colouration it approaches nearer to the latter than the former.

Scolia maura, F.

In June Col. Nurse captured at Quetta the ♀ and ♂ of what I can only make out to be this species. The ♂ is 15, the ♀ 13 mm. long. It is an entirely black species with uniformly dark fuscous violaceous wings. It is found on both sides of the Mediterranean and southwards extends into Abyssinia.

DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA.

By

E. Meyrick, B.A., F.R.S., F.Z.S.

V

(Continued from page 994 of Vol. XVII.)

Epiblemidæ.

Eucosma attica, n. sp.

♂ ♀. 18-23 mm. Head pale ochreous mixed with dark fuscous, face blackish. Palpi ascending, pale ochreous suffused with grey, ochreous-white towards base beneath, terminal joint very short. Thorax pale ochreous mixed with blackish and ferruginous. Abdomen pale ochreous suffused with grey. Posterior tibiæ in ♂ clothed with dense long projecting hair scales above. Forewings elongate, posteriorly considerably dilated, costa moderately arched, apex obtuse, termen almost straight, nearly vertical; pale ochreous mixed with ferruginous, and irregularly strewn with leaden-grey dots; costa with pairs of ochreous-whitish strigulæ separated with black; basal patch undefined, mixed with blackish, sometimes with strong blackish suffusion extending to central fascia; central fascia moderate, suffused with blackish, its posterior edge marked with a white discal dot, and followed except on costa by a suffused white fascia mixed with leaden-grey on anterior half; apical area ferruginous, mixed with blackish anteriorly, with several short leaden-metallic marks from costa, and a striga from costa at ¾ continued along lower half of termen to tornus: cilia leaden-grey, on upper half of termen with basal half ferruginous, sometimes mixed with blackish, towards tornus suffused with ochreous-whitish. Hindwings in ♂ with dorsal fold enclosing thin pencil of long grey hairs; fuscous, becoming darker posteriorly; cilia light greyish-ochreous or grey, with dark grey subbasal line.

Khasi Hills, from June to September; seven specimens. I find that *Platypeplus*, Wals., cannot be properly maintained as a distinct genus; the development of brushes of scales on the posterior tibiæ, especially in the ♂ but sometimes in both sexes, is found in a proportion of the Indian species of most genera in this family, and appears to have little value as a test of affinity; I shall therefore treat it as affording specific characters only, and refer all those species described under *Platypeplus* to *Eucosma*.

Eucosma iograpta, n. sp.

♂ ♀. 13-15 mm. Head and thorax ferruginous-ochreous, thorax sometimes mixed with dark grey. Palpi porrected, ferruginous-ochreous mixed with dark grey, towards base beneath ochreous-whitish. Abdomen dark grey. Posterior legs without tufts. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen almost straight, hardly oblique; ferruginous-ochreous; costa obscurely strigulated with blackish and grey-whitish; a rather oblique rounded-triangular deep ferruginous blotch on dorsum at ⅓, reaching half across wing; central fascia deep ferruginous, sometimes mixed with black, becoming broad dorsally, posterior edge with three irregular acute projections, preceded and followed by rather broad purplish-leaden grey fasciæ, each consisting of several subconfluent strigæ; apical area deep ferruginous somewhat mixed with blackish, including several small purplish-leaden marks beneath costa and an oblique striga: cilia dark purplish-grey irrorated with whitish points, with a blackish-grey subbasal line mixed with deep ferruginous. Hindwings rather dark fuscous, darker posteriorly; cilia grey, with darker subbasal line.

Khasi Hills, in June and July; twelve specimens.

Eucosma rhodantha, n. sp.

♂. 20 mm. Head and palpi yellow-ochreous. Thorax pale ochreous, yellower anteriorly. Abdomen grey. Posterior tibiæ clothed with dense projecting scales above. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen nearly straight, hardly oblique; bright crimson-rose, costa faintly darker-strigulated; a greenish-ochreous basal patch, deep yellow in middle of base, and with a small ochreous-brown dorsal mark near base, outer edge rather irregular, running from before ⅓ of costa to beyond middle of dorsum; a small ochreous apical spot, edged below by a triangular white mark; cilia crimson-rose, with a whitish-ochreous apical patch extending to near middle of termen. Hindwings rather dark grey, darker posteriorly; cilia grey, round apex whitish-grey, with dark grey subbasal line.

Khasi Hills, in September; one specimen.

Eucosma mniochlora, n. sp.

♂ ♀. 22—23 mm. Head, palpi, and thorax rather deep green, thoracic crest large, bifid. Abdomen rather dark grey. Posterior legs without tufts. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen sinuate, hardly oblique; rather deep green, somewhat mixed with whitish on margin of dark markings; markings dark bronzy-fuscous, somewhat mixed with deep green, and finely edged with black; costal edge ochreous-whitish, with scattered dark fuscous dots; an irregular transverse spot on costa at ¼, and a longitudinal upwards-angulated mark in disc beneath it; two small spots on dorsum at ¼ and ½; central fascia moderate, irregular, widely interrupted below middle, dorsal portion reduced to a triangular prætornal spot; four small spots on costa posteriorly; a triangular blotch in disc posteriorly, of which one angle touches third of these spots, one almost reaches central fascia, and one is connected by an arm with termen above tornus; one or two small white marks beneath anterior angle of this: cilia green, indistinctly barred with fuscous towards middle of termen, base ochreous-whitish. Hindwings rather dark grey, darker posteriorly; cilia grey.

Palni Hills (6000 feet); six specimens (Campbell).

Eucosma mosaica, n. sp.

♂ ♀. 19—20 mm. Head and thorax brownish-ochreous, thorax more or less mixed with grey, crest tinged with ferruginous. Palpi ascending, with appressed scales, whitish-ochreous or pale ochreous with two or three black scales, terminal joint very short. Abdomen dark grey. Posterior legs without tufts. Forewings elongate, hardly dilated, costa gently arched, apex obtuse, termen gently rounded, somewhat oblique ; brownish-ochreous ; markings shining blue-grey, finely edged with whitish ; a broad patch occupying costal ¾ towards base, whence proceeds a thick downwards curved streak from beneath costa before middle through disc, nearly reaching a round subterminal spot beneath apex ; upper edge of streak broken by a small dark-brown spot in middle of curve ; a short thick oblique streak from middle of costa, followed by more or less blackish suffusion ; several costal dots, and a subcostal dot above subapical spot ; a broad dark-brown streak occupying dorsal fourth towards base and continued following margin of grey marking above it to termen, where it is expanded to reach tornus ; a transverse rounded spot on middle of dorsum, anteriorly edged by this streak ; an irregular mark on tornus, and a subterminal dot above it : cilia brown, somewhat sprinkled with whitish, in middle of termen and beneath tornus more or less marked with dark grey. Hindwings whitish-fuscous, with broad blackish-fuscous terminal fascia ; cilia ochreous-whitish, with dark fuscous basal line, round apex fuscous.

Maskeliya, Ceylon (Alston) ; Palni Hills (Campbell) ; three specimens.

Eucosma miltographa, n. sp.

♂ ♀. 17—19 mm. Head grey irrorated with white, sides ferruginous-ochreous Palpi ochreous-orange, upper surface white irrorated with dark fuscous. Thorax ferruginous ochreous or fulvous, with broad dark grey dorsal stripe sprinkled with whitish. Abdomen dark fuscous. Posterior legs without tufts. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen almost straight, hardly oblique ; varying from ferruginous-ochreous to brownish, towards costa and on anterior ⅗ of disc irregularly strewn with small ferruginous-red spots or strigulæ ; a narrow dorsal streak varying from whitish to fuscous, sometimes edged with reddish or dark fuscous above, with an obtuse-triangular projection beyond middle, whence an angulated ferruginous-red or dark purplish-fuscous striga crosses wing to costa beyond middle : cilia deep ferruginous becoming whitish-ochreous towards tornus, outer half whitish on upper half of termen, dark grey on lower half of termen and at apex Hindwings dark fuscous, disc thinly scaled and semiopaque, obscurely and irregularly marked with ochreous-yellowish ; cilia ochreous-whitish tinged with grey, with dark grey subbasal line.

Peradeniya, Ceylon (Green) ; Palni Hills (Campbell) ; in November, four specimens.

Enarmonia ioxantha, n. sp.

♂ ♀. 16—18 mm. Head and thorax grey, shoulders tinged with ferruginous. Palpi whitish, somewhat mixed with grey. Abdomen grey. Posterior tibiæ and basal joint of tarsi in ♂ clothed with long dense rough scales above. Forewings elongate-triangular, costa gently arched, apex obtuse, termen straight, little oblique ; deep ferruginous ; costa with seven pairs of oblique whitish strigulæ between ¼ and apex, first five emitting short violet streaks, longest anteriorly, costal edge blackish between these ; a broad ochreous-grey streak along dorsum from base to near tornus, narrowed posteriorly, upper edge with two pale violet whitish-edged projections, first before middle, triangular, second narrow, rising from its extremity and directed obliquely towards apex, reaching half across wing ; terminal area beyond this forming a deep orange fascia, containing some deep ferruginous marking in middle, two whitish dots on termen beneath apex, and a wedge-shaped pale violet partly whitish-edged spot on tornus : cilia dark grey mixed with deep ferruginous, on upper half of termen with outer ⅔ ochreous-whitish. Hindwings in ♂ with large dorsal expansible pencil of long whitish-ochreous hairs ; dark fuscous ; cilia grey-whitish, with dark fuscous basal line.

Khasi Hills, from June to August ; twenty specimens.

Enarmonia ancalota, n. sp.

♂ ♀. 17—18 mm. Head, palpi, and thorax grey-whitish, thorax with small posterior crest. Abdomen in ♂ whitish-grey-ochreous, in ♀ grey. Posterior tibiæ in ♂ clothed with hairs above. Forewings elongate, posteriorly dilated, costa moderately arched, apex obtuse, termen slightly sinuate, nearly vertical ; yellow-ochreous, irregularly mixed with ferruginous-brownish ; costa with some obscure pairs of minute pale strigulæ ; a broad pale whitish-fuscous dorsal streak edged above with white, broadest at ¼, where it reaches more than half across wing, rapidly narrowed to tornus, upper edge with a triangular indentation in middle of wing filled with brown ; a somewhat curved transverse series of six blackish dots from tornus, reaching more than half across wing, two lowest preceded by similar dots ; an oblique series of blackish dots from near costa at ⅓ to termen above tornus: cilia ochreous mixed with brownish, at tornus suffused with whitish. Hindwings in ♂ with dorsal edge recurved, forming a shallow pocket clothed with loose hairs ; in ♂ pale fuscous, in ♀ rather dark fuscous, darker posteriorly ; cilia in ♂ whitish-fuscous, in ♀ grey.

Kandy and Maskeliya, Ceylon, in May and September to November ; six specimens (Green, Pole).

Enarmonia melanacta, n. sp.

♂. 14—16 mm. Head and palpi dark grey, palpi curved, ascending, smooth-scaled. Thorax dark grey mixed with black, posterior half of patagia and a posterior spot white. Abdomen rather dark grey. Posterior tibiæ clothed with long rough expansible hairs above. Forewings elongate, costa slightly arched, apex obtuse, termen slightly rounded, somewhat oblique ; yellowish-white, somewhat marked with pale yellow on margins of dark markings ; costa spotted with black ; a thick black zigzag streak above middle from base to apex, angulated thrice downwards and twice upwards, upper angulations suffused into dark leaden-grey costal blotches on basal fourth and beyond middle, lower edge towards tornus irregular and mixed with leaden-grey ; two large trapezoidal black spots on dorsum at ⅓ and before tornus ; a pale yellow angulated striga from ⅔ of costa to tornus, interrupted by the black streak : cilia yellowish-white, with blackish bars in middle of termen and at apex. Hindwings rather dark grey ; cilia grey.

Khasi Hills, in June ; three specimens. The palpi are peculiar, but do not seem here to be of more than specific value.

Erinœa, n. g.

Antennæ in ♂ stout, serrulate, pubescent. Palpi moderate, porrected, second joint with expanded scales towards apex. Thorax smooth. Forewings in ♂ without fold, termen sinuate ; 3 and 4 curved and approximated throughout, 5 absent, 7 and 8 stalked. Hindwings with 3 and 4 stalked, 5 closely approximated at base, 6 and 7 closely approximated towards base.

Allied to *Cydia* but characterised by the peculiar neuration.

Erinœa chlorantha, n. sp.

♂ ♀. 17-21 mm. Head grey-whitish, sides mixed with blackish. Palpi blackish-grey, apex of joints whitish. Thorax olive-greenish somewhat mixed with whitish, on shoulders and posteriorly mostly suffused with black. Abdomen grey. Posterior tibiæ in ♂ with brush of dense long projecting scales on basal half beneath. Forewings elongate, costa moderately arched, apex tolerably pointed, termen slightly sinuate, somewhat oblique ; pale grey or whitish, irregularly mixed with olive-green ; markings purplish-grey or fuscous, irregularly edged and mixed with blackish ; seven irregular costal spots, first with an angulated streak extending to dorsum forming edge of basal patch, second extended as an irregular fascia to dorsum before middle, thence angulated upwards to disc beyond middle, and again downwards to near tornus ; some small scattered variable black marks on costa and dorsum, and in disc ; an irregular blotch towards apex : cilia whitish, somewhat mixed with grey and olive-greenish. Hindwings grey ; cilia grey, with darker subbasal line.

Maskeliya, Ceylon, from December to April ; nine specimens (Pole, de Mowbray).

Tmetocera calceata, n. sp.

♂ ♀. 14-18 mm. Head ochreous-white. Palpi whitish irrorated with grey. Thorax ochreous-white, anteriorly more or less suffused with grey. Abdomen grey. Forewings elongate, costa gently arched, apex, obtuse, termen faintly sinuate, little oblique, rounded beneath ; ochreous-white, strigulated with brown, grey, or dark fuscous, except on a broad undefined streak extending from middle of dorsum to costa before apex, interstices of strigulation more or less silvery or filled up with leaden-metallic, sometimes forming definite streaks from costa ; ocellus long, narrow, broader upwards, margined laterally with thick leaden-metallic streaks, and filled with six or seven irregular small black spots, preceded on dorsum by a short erect leaden-metallic mark enclosed between two black streaks : cilia grey speckled with dark grey. Hindwings rather dark grey ; cilia grey.

Khasi Hills, in June ; eleven specimens. Very close to the European *ocellana*, but easily distinguished by the white head.

Ancylis thalera, n. sp.

♂♀. 13-15 mm. Head and thorax fulvous-ochreous, face whitish. Palpi whitish-ochreous mixed or suffused with grey, beneath white towards base, second joint tufted with long scales beneath. Abdomen dark-grey. Forewings elongate, costa moderately arched, apex tolerably pointed, termen concave, little oblique, rounded beneath; ochreous, obscurely strigulated with fulvous, posterior half suffused with deeper fulvous; costa with pairs of obscure pale strigulæ, separated by a few blackish scales, last five emitting short oblique leaden-metallic streaks, second of these extended as a very oblique striga to near termen beneath apex; a triangular tornal blotch mixed with grey and grey-whitish, becoming leaden-metallic towards apex, anterior edge oblique, so that apex is near middle of termen; a blackish terminal line: cilia whitish-ochreous, basal half silvery-grey-whitish, sometimes partly tinged with fulvous, above apex fulvous edged beneath with white, beneath this with two slender fulvous bars separated with white. Hindwings with 3 and 4 connate; dark grey; cilia grey, with darker subbasal line.

Khasi Hills, from June to August; twenty specimens. Though differing from other species in having 3 and 4 of hindwings connate instead of stalked or coincident, this species otherwise agrees well here.

Cydia capitulata, n. sp.

♂. 12-14 mm. Head pale greyish-ochreous, anterior half of crown blackish. Palpi blackish, terminal joint and apex of second grey-whitish. Thorax grey-whitish variably spotted with black. Abdomen pale grey, anal tuft whitish-ochreous. Forewings elongate, rather narrow, costa anteriorly gently arched, apex round-pointed, termen sinuate, oblique; grey-whitish, base of scales mostly finely grey, with a few scattered grey strigulæ; costa strigulated with blackish, dorsum and termen also with some minute blackish strigulæ; a dark fuscous or blackish trapezoidal blotch, more or less mixed with leaden-grey, extending on costa from before middle to rather near apex, and reaching half across wing, much narrowed downwards so that lower edge is about half upper, including four pairs of pale strigulæ on costa: cilia whitish, sprinkled towards tips with blackish. Hindwings grey; cilia light greyish-ochreous, with grey subbasal line.

Maskeliya, Ceylon, in June and November; three specimens (Pole).

Cydia glaciata, n. sp.

♂♀. 11-14 mm. Head white, sides fuscous. Palpi dark fuscous, terminal joint and apex of second white. Thorax ochreous-white, with blackish spots on shoulders and at posterior extremity. Abdomen pale grey. Forewings elongate, somewhat dilated, costa gently arched, apex obtuse, termen slightly sinuate, somewhat oblique; ochreous-white, more distinctly ochreous-tinged posteriorly; a broad almost basal dark fuscous fascia mixed with leaden-metallic and black, outer edge nearly straight, oblique, running from ¼ of costa to ⅖ of dorsum; four small dark fuscous spots on posterior half of costa, and some scattered black costal strigulæ; a triangular dark fuscous spot mixed with black on dorsum at ⅓, and two or three black dorsal strigulæ ; an interrupted black terminal line : cilia dark grey sprinkled with white, and at tips with black. Hindwings grey ; cilia pale grey.

Khasi Hills, in June and July ; four specimens.

Cydia speculatrix, n. sp.

♂ ♀. 12-15 mm. Head light ochreous, sides mixed with dark fuscous. Palpi dark fuscous, basal joint and a subapical bar of second joint whitish-ochreous. Thorax dark fuscous mixed with pale ochreous. Abdomen dark fuscous, in ♂ suffused with pale ochreous on sides and apex. Forewings elongate, posteriorly dilated, costa moderately arched, apex obtuse, termen sinuate, rather oblique ; dark fuscous, more or less mixed irregularly with pale ochreous ; costa with eight pairs of oblique whitish strigulæ, second to fourth giving rise to three obscurely double leaden-metallic striæ mixed with whitish, first limiting basal patch, angulated in middle, second irregular, preceding central-fascia, which is blackish-fuscous, obliquely interrupted with pale ochreous in middle and leaden-metallic below middle, third following central fascia, rather curved or obtusely bent in middle ; a leaden-metallic stria from fifth pair of costal strigulæ to sinuation of termen, continued along termen to tornus, enclosing with the preceding stria the ocellus, which is crossed by three longitudinal pale ochreous dashes ; last three pairs of strigulæ emitting short leaden-metallic marks, surrounded with ochreous : cilia light ochreous-yellowish, with a black median line preceded by a dark leaden-grey shade base, whitish. Hindwings in ♂ thinly scaled, whitish-grey tinged with yellowish, apex mottled with grey, with dorsal pencil of blackish hairs, cilia whitish-ochreous, with grey subbasal line ; in ♀ dark grey, cilia grey, with darker subbasal line.

Khasi Hills, in September ; twelve specimens. Also one ♂ from Darjiling, in August, with hindwings greyer, but apparently not otherwise different.

Laspeyresia leucitis, n. sp.

♀. 19 mm. Head, palpi, and thorax leaden-grey, palpi beneath whitish. Abdomen grey-whitish. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen little oblique, rounded, faintly sinuate beneath apex ; rich brown ; a leaden-grey basal patch, outer edge angulated, cut by a streak of ground colour above middle ; seven pairs of minute white costal strigulæ, separated with blackish, and giving rise to leaden-grey streaks, first two subconfluent, very strongly angulated in disc, where they are connected by a streak with angle of basal patch, surrounded on dorsal half by a broad blackish suffusion, third sinuate-curved, running to dorsum before tornus, fourth and fifth extremely short, sixth and seventh slender, confluent beneath apex and running to tornus, interrupted above and below middle ; some dark fuscous suffusion extending from beneath fourth and fifth towards middle of termen; cilia leaden-grey, with blackish basal line. Hindwings white ; a small basal patch of blackish suffusion ; a moderate blackish terminal band, attenuated downwards and not reaching tornus ; cilia white, round apex grey, with blackish basal line.

Khasi Hills ; one specimen.

Laspeyresia callisphena, n. sp.

♂ ♀. 10-11 mm. Head leaden-grey, forehead and sides yellow, face whitish. Palpi pale yellow. Thorax bluish-leaden. Abdomen dark grey. Forewings elongate-triangular, costa gently arched, apex obtuse, termen obliquely rounded; bluish-leaden-grey, posterior half suffused with blackish; six oblique pale yellow wedge-shaped marks from posterior half of costa, surrounded with black, each pair of marks terminating beneath in a short violet-metallic mark; an oblique violet-metallic bar from middle of dorsum, broadly edged with black anteriorly, reaching more than half across wing; beyond this two converging pale yellow wedge-shaped marks from dorsum, reaching half across wing, sometimes united above, surrounded with black suffusion; a transverse violet-metallic bar above tornus, not quite reaching it: cilia bluish-leaden-grey. Hindwings dark fuscous; cilia light grey, with a blackish basal line, tips blue-whitish.

Khasi Hills, in September and October; fifty specimens.

Laspeyresia isacma, n. sp.

♂ ♀. 9-10 mm. Head rather dark bronzy-fuscous, face and palpi whitish. Thorax and abdomen dark bronzy-fuscous. Forewings elongate, somewhat dilated, costa moderately arched, apex obtuse, termen somewhat obliquely rounded; dark fuscous, with prismatic reflections; nine well defined short oblique whitish streaks from costa between ¼ and apex, second, fourth, sixth, and ninth emitting indistinct short bluish-leaden-metallic streaks; a patch of four indistinct fuscous-whitish oblique strigæ from about middle of dorsum, reaching about half across wing; ocellus narrow, obscurely margined with bluish-leaden-metallic: cilia fuscous, with blackish basal line. Hindwings dark fuscous; cilia grey, with dark fuscous basal line.

Khasi Hills, in May and September; fifteen specimens.

Laspeyresia ochropa, Meyr.

(*Lipoptycha ochropa*, Meyr., Journ. Bombay N. H. Soc. XVI., 587.)

This species should be referred here; veins 6 and 7 of the hindwings are separate but not parallel as in *Lipoptycha*, and the different palpi afford a reliable character.

Laspeyresia dissias, n. sp.

♂. 8 mm. Head pale brownish-ochreous, face pale ochreous-yellowish, becoming whitish beneath. Palpi whitish-ochreous. Thorax light fuscous. Abdomen rather dark fuscous. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen rather obliquely rounded, distinctly sinuate beneath apex; rather dark fuscous, base of scales whitish, appearing finely striated; five oblique hardly perceptibly double whitish streaks from costa between ¼ and ¾, alternating with dark fuscous streaks, first two terminating in short leaden-metallic streaks, third and fifth in somewhat interrupted bent bluish-leaden-metallic striæ running to about tornus; two short whitish costal streaks before apex converging to a bluish-leaden-metallic dot; dorsal half with more or less indistinct whitish strigæ, four towards middle more distinct and forming an oblique patch reaching half across wing; two black dots resting on termen below middle; apex ochreous-tinged: cilia light bluish-grey, with black basal line. Hindwings dark fuscous; cilia light grey, with dark fuscous subbasal line edged with whitish.

Barberyn Island, Ceylon: in February; one specimen (Fletcher).

Laspeyresia hemidora, n. sp.

♂ ♀. 11-12 mm. Head yellow mixed with blackish. Palpi yellow, with some black scales in middle of second joint. Thorax yellow irrorated with blackish. Abdomen dark grey. Forewings elongate-triangular, costa moderately arched, apex obtuse, termen somewhat rounded, rather oblique; deep coppery-orange or orange-red; basal half yellow strigulated with black, limited by a thick dark purplish-leaden transverse streak not reaching costa, its posterior edge very irregular; posterior half of costa with pairs of obscure whitish strigulæ separated with black; a dark purplish-leaden streak from middle of costa to near termen beneath apex, thence abruptly curved and continued near termen to tornus; four small dark purplish-leaden spots beneath costa posteriorly; space between stria and median streak strewn with irregular dark purplish-leaden marks; a row of irregular blackish dots before termen: cilia ochreous-yellow, irregularly barred with dark leaden-grey, and with a dark leaden-grey basal line. Hindwings dark grey; cilia ochreous-whitish, suffused with pale grey towards apex and tornus, with dark grey basal line.

Khasi Hills, in September; four specimens.

Laspeyresia endrosias, n. sp.

♂ ♀. 10-13 mm. Head, palpi, and thorax dark fuscous, closely irrorated with pale greyish-ochreous. Abdomen dark fuscous. Forewing elongate, posteriorly dilated, costa slightly arched, apex obtuse, termen rather obliquely rounded, sinuate beneath apex; dark fuscous, basal area as far as a line running from ¼ of costa to tornus finely irrorated with pale greyish-ochreous; remainder of wing crossed by irregular curved partly confluent ferruginous-fulvous lines, rising from numerous very fine paired oblique whitish costal strigulæ, and three bluish-leaden lines, third running to termen beneath apex; between the first two metallic lines towards tornus the ground-colour appears as a transverse series of four blackish dots or very short dashes: cilia leaden-grey, with black basal line. Hindwings grey, with whitish-grey suffusion in middle of disc, and broad blackish terminal band; cilia whitish-grey, with blackish basal line.

Khasi Hills, in June and July; eight specimens.

Laspeyresia chelias, n. sp.

♂. 11 mm. Head, thorax, and abdomen fuscous, face and palpi whitish-ochreous. Forewings elongate, somewhat dilated, costa gently arched, apex obtuse, termen little oblique, rounded, sinuate beneath apex and rather prominent in middle purplish-fuscous, with prismatic reflections; posterior half of costa with several pairs of minute whitish strigulæ, and two approximated triangular ochreous-white spots immediately before apex; a bluish-leaden line from middle of costa obliquely to disc near middle of termen, thence obtusely angulated to tornus, and another from ¾ of costa to termen beneath apex; three blackish dots close before lower half of termen: cilia fuscous, with dark bluish-fuscous basal line. Hindwings rather dark fuscous, lighter towards base; cilia whitish-fuscous, with dark fuscous basal line.

Maskeliya, Ceylon, in October; one specimen (Pole).

Laspeyresia cyanogona, n. sp.

♂. 10-11 mm. Head pale ochreous-grey, face more whitish-ochreous. Palpi whitish-ochreous, a dot in apical scales of second joint beneath, and terminal joint above grey. Thorax ochreous-grey. Abdomen grey. Forewings elongate, somewhat dilated posteriorly, costa gently arched, apex obtuse, termen somewhat obliquely rounded, sinuate beneath apex; rather dark fuscous, basal half with a purplish-leaden gloss, posterior half mostly suffused with light yellow-ochreous; fine pairs of oblique whitish costal strigulæ beween ¼ and ¾, each emitting a short oblique blue-leaden-metallic streak except fourth which is single and has no streak, third angulated in middle and continued as a thick striga to tornus; indistinct blackish strigæ from costa before and beyond this streak, some irregular black dots in disc before angle, and four undefined black dots following its lower half; two short thicker white marks on costa before apex, beneath which is a leaden-blue metallic dot; a triangular central dorsal patch of four purplish-grey strigæ converging upwards to a point, reaching half across wing: cilia shining bluish-grey, with a black basal line, very finely cut with white on subapical sinuation. Hindwings dark fuscous; cilia grey-whitish, with dark fuscous basal line.

Khasi Hills, in September; two specimens.

Laspeyresia crocopa, n. sp.

♂. 14 mm. Head and palpi ochreous-yellow. Thorax and abdomen fuscous. Forewings elongate, hardly dilated, costa slightly arched, apex obtuse, termen somewhat obliquely rounded, faintly sinuate beneath apex; rather dark fuscous, finely irrorated with grey-whitish except towards costa, crossed by about ten dark purplish-leaden-grey lines rising from pairs of indistinct minute whitish costal strigulæ, angulated above middle, suffused and indistinct in disc, sixth and seventh forming margins of ocellus with two well-defined leaden streaks, last three converging towards termen beneath apex; three short undefined blackish dashes in ocellus, and an oblique blackish striga above it: cilia rather dark fuscous, irrorated with grey-whitish. Hindwings fuscous; cilia light fuscous, with somewhat darker sub-basal line.

Galboda, Ceylon, in November; one specimen (Pole).

Laspeyresia pseudonectis, n. sp.

♂. 10 mm. Head greyish-ochreous. Palpi pale greyish-ochreous. Thorax fuscous irrorated with pale greyish-ochreous. (Abdomen broken.) Posterior tibiæ and basal joint of tarsi beneath clothed with long dense projecting scales. Forewings elongate, not dilated, costa gently arched, apex obtuse, termen straight, little oblique, rounded beneath; dark fuscous, finely irrorated with fuscous-whitish except on costa; costa between ¼ and apex with seven pairs

igulæ, whence proceed obscure short purple-leaden strigæ, those
l fifth pairs crossing wing, angulated in middle, forming margins
aree short black dashes in ocellus, diminishing in length down-
fuscous irrorated with fuscous-whitish. Hindwings fuscous,
oadly sprinkled with black ; cilia whitish-fuscous.

ctober ; one specimen (Maxwell-Lefroy). Larva tunnels stems of
acea (Maxwell-Lefroy). Very similar to *L. tricentra*, but distinct by
aracters of posterior legs and hindwings.

a ptychora, n. sp.

·15 mm. Head and thorax fuscous sprinkled with whitish-ochreous.
h-ochreous, slightly sprinkled with fuscous. Abdomen grey, slight-
with black. Forewings elongate, not dilated, costa gently arched,
, termen slightly sinuate beneath apex, hardly oblique, rounded
lark fuscous, finely irrorated with ochreous-whitish except towards
riorly ; costa throughout with nine pairs of whitish strigulæ, last six
to short oblique leaden-metallic streaks, seventh running to termen
ex ; ocellus margined laterally by leaden-metallic streaks, and con-
ee elongate black dots : cilia dark fuscous, irrorated with ochreous-
Hindwings grey ; in ♂ a very slender submedian hair-pencil from
owed by a few dark grey scales, dorsal area rather broadly strewn
grey scales, dorsal edge and cilia recurved upwards to form a pocket ;
grey.

rg (3,000 feet), in August (Newcome) ; Madulsima, Ceylon, in Novem-
ghan) ; six specimens. Also very close to *L. tricentra* ; the hindwings
ck scales as in *L. pseudonectis*, and dorsal pocket as in *L. parastrepta*.

ressia parastrepta, n. sp.

12-18 mm. Head and thorax dark fuscous irrorated with whitish-
. Palpi whitish-ochreous sprinkled with grey, terminal joint grey
Abdomen dark fuscous. Forewings rather elongate, moderately broad,
ntly arched, apex obtuse, termen hardly oblique, rather abruptly
l beneath apex ; dark fuscous, irrorated with whitish-ochreous ; seven
oblique whitish costal strigulæ, followed by three single strigulæ
s apex, third to seventh pairs emitting oblique blue-leaden-metallic
, sixth very short, seventh running to termen beneath apex, præapical
a terminating in a blue-leaden-metallic dot ; two oblique blue-leaden
ic lines from dorsum near middle, converging upwards and nearly reach-
ak of fifth pair of costal strigulæ ; ocellus margined laterally by strong
aden-metallic streaks, and containing three elongate black dots resting
terior edge : cilia dark grey, towards base grey-whitish, with a blackish
line. Hindwings in ♂ with dorsal margin and cilia curved upwards
to form a groove or pocket ; dark fuscous, becoming blackish-fuscous
iorly ; cilia grey, with dark fuscous basal line, extreme tips white.

Hills, in September ; twenty-five specimens. Very similar to *L.*
tra ; this group of closely allied species requires much care in deter-

mination ; the secondary sexual characters of the ♂ afford easy di in the ♀ the shape of wings is perhaps the most reliable *darastrepta* the forewings are broader and the termen more obviou than in the others.

GELECHIADÆ.

Idiophantis melanosacta, n. sp.

♂ ♀. 12-13 mm. Head, palpi, antennæ, thorax, and abdom ochreous ; terminal joint of palpi with dark fuscous lateral lin dark fuscous. Forewings elongate, costa slightly arched, termen w elliptical excavation between slender acute apical and broader o prominences ; 2 and 3 long stalked, 6 absent ; whitish-ochreous ; blackish patch extending along costa from base to beyond mi oblique, lower edge forming two broad subtriangular prominence about half across wing ; two undefined blackish dots longitudinally disc beyond middle ; an angulated whitish line from ¾ of costa before tornal prominence, edged with fuscous and on costa with bl fine oblique parallel fuscous line beyond this on upper half ; a bronz dot edged anteriorly with black on termen beneath base of excavat whitish-ochreous, tips whitish, within excavation with a blackish sub- towards apex of both prominences. Hindwings grey ; cilia pale gre apex with a blackish-grey sub-basal line edged with whitish-ochreous s

N. Coorg (3,000 feet), in June ; three specimens (Newcome).

Idiophantis chalcura, n. sp.

♂. 15 mm. Head greyish-ochreous, face whitish-ochreous. Palpi grey, upper edge whitish-ochreous. Antennæ whitish dotted with da towards base lined with black, toward apex with two blackish-grey Thorax light greyish-bronze. Abdomen grey, segmental margins o whitish, basal half blackish-grey above. Forewings elongate, rather costa slightly arched, termen with deep elliptical excavation between acute apical and broad rounded tornal prominence ; 2 and 3 sepa present ; light ochreous-fuscous, costal half suffused with dark fuscous and second discal stigmata large, cloudy, dark fuscous, latter preceded additional elongate dot ; two oblique white streaks, black-edged poste from costa about ¾, first running to base of excavation, second to apex between and beyond these pale ochreous ; a black dot on base of excav tornal prominence bronzy-metallic, edged anteriorly with blackish at extre and crossed by two longitudinal pale yellowish lines : cilia whitish-och on termen bronzy-metallic, beneath apical prominence mixed with dark gr apex with a triangular white mark. Hindwings blackish-grey ; cilia dark round apex with a blackish subbasal line edged with pale greyish-ochreou

Khasi Hills, in October ; one specimen.

Idiophantis discura, n. sp.

♂ ♀. 13-14 mm. Head and thorax light bronzy-ochreous, face thorax fuscous-tinged. Palpi whitish-ochreous, anteriorly irrorated with cous. Antennæ pale grey, above dark fuscous. Abdomen grey, anal tuft whitish-ochreous. Forewings elongate, rather narrow, costa slightly arched, termen with a deep elliptical excavation between slender pointed apical and broad obtuse tornal prominence; 2 and 3 separate, 6 present; fuscous; a strongly-curved light leaden-bluish dark-edged line from ⅔ of costa to dorsum before tornal prominence, more or less obscurely margined with ochreous anteriorly; apical and tornal prominences, beyond this light ochreous-yellow, with a grey-whitish streak along upper part of apical prominence, and some black suffusion towards middle of termen: cilia bronzy-fuscous, at base of excavation and on lower side of tornal prominence light ochreous-yellow. Hindwings grey; in ♂ beneath with a furrow along lower margin of cell, covered with a fringe of long hairs; cilia grey, on upper half of termen whitish-yellowish, round apex with dark fuscous subbasal line.

Maskeliya, Ceylon; in February and September, three specimens (de Mowbray, Alston).

Idiophantis hemiphæa, n. sp.

♂ ♀. 13-16 mm. Head pale ochreous, face whitish-ochreous. Palpi light silvery-grey. Antennæ ochreous-whitish, on basal half with a blackish line above, towards apex with three narrow dark fuscous bands. Thorax pale ochreous, anteriorly suffused with dark fuscous. Abdomen whitish-ochreous sprinkled with grey. Forewings elongate, rather narrow, costa slightly arched, termen with a deep circular excavation between slender acute apical and broader obtuse tornal prominence; 2 and 3 separate, 6 present; pale ochreous, costal half from base to posterior streaks suffused with rather dark fuscous, darkest towards base; two fine oblique whitish posteriorly black-edged streaks, first meeting a very undefined erect line of pale bronzy-metallic and blackish scales from dorsum before tornal prominence, second running into apex; tornal prominence beyond this line suffused with coppery-metallic on margins; a black dot at base of excavation: cilia whitish-ochreous, on termen metallic bronze with two undefined dark fuscous lines, above apex with a triangular white black-edged mark. Hindwings grey; cilia pale greyish-ochreous or whitish-fuscous, round apex with a blackish subbasal line.

Khasi Hills, from April to October; twenty specimens.

Idiophantis stoica, n. sp.

♂. 15-16 mm. Head and thorax light bronzy-ochreous, face whitish-ochreous. Palpi whitish-ochreous, anterior edge white margined with blackish lines. Antennæ whitish lined with blackish. Abdomen whitish-ochreous suffused with grey. Forewings elongate, rather narrow, costa gently arched, termen semicircularly concave beneath produced pointed apex, tornus rounded-prominent; 2 and 3 separate, 6 present; pale ochreous, irregularly tinged with fuscous; a cloudy dark fuscous subdorsal dot at ¼; stigmata blackish, plical represented by two transversely placed dots enclosed in fuscous suffusion, second discal by two transversely placed dots, an additional dot midway between lower of these and upper plical; an oblique white line from ⅗ of costa, edged with black on costa, angulated opposite terminal concavity and continued obsoletely to near tornus ; a white dark-edged line from costa beyond this running to apex ; some blackish suffusion on termen towards middle : cilia pale greyish-ochreous, on termen tipped with grey, beneath apex with a black basal line, towards middle of termen with a bronzy-metallic basal spot. Hindwings grey, paler towards base ; cilia pale grey, round apex whitish with a black subbasal line.

Palni Hills, Gooty; two specimens (Campbell).

Anorthosia sandycitis, n. sp.

♂ ♀. 18-19 mm Head fuscous. Palpi fuscous, second joint becoming ochreous-brown anteriorly, expansible hairs sprinkled with whitish, terminal joint whitish, anterior edge dark fuscous. Antennæ greyish, spotted with dark fuscous. Thorax fuscous, in ♂ with two red dorsal marks. Abdomen rather dark fuscous. Forewings elongate, rather narrow, slightly dilated posteriorly, costa slightly arched, apex obtuse, termen somewhat sinuate, rather oblique ; glossy fuscous, markings blood-red ; an oblique mark near base ; six small spots in disc arranged in three pairs, and a seventh between and above second and third pairs ; a dot on dorsum towards tornus, sometimes united with third pair to form a curved bar ; a narrow streak along costa from ⅓ to ⅘, thence continued as a transverse streak to tornus ; a blackish line along posterior part of costa and termen : cilia yellow-ochreous, beneath tornus fuscous. Hindwings grey, in ♀ rather darker ; cilia grey, round apex and upper half of termen suffused with pale yellow-ochreous, with grey subbasal shade.

Khasi Hills, in June and September ; Kandy, Ceylon, in April (Green) ; six specimens.

XYLORYCTIDÆ.

Ptochoryctis simbleuta, n. sp.

♂ ♀. 11-17 mm. Head, palpi, antennæ, thorax, and abdomen white ; antennal pectinations in ♂ short, grey ; thorax usually with a few blackish scales ; abdomen broadly banded with ferruginous. Forewings suboblong, moderate, costa gently arched, apex obtuse, termen hardly rounded, rather oblique ; white, with some irregularly scattered black scales, especially in disc ; a patch of cloudy fuscous suffusion extending from disc beyond middle to tornus ; a præmarginal series of black dots from ⅔ of costa to tornus : cilia white, with fine black median line, apical third grey except above apex and on tornus. Hindwings pale grey ; cilia white, with a faint grey median line.

Gazepore, Assam, in March and April ; eight specimens bred (Antram). Larva brick-red ; feeds beneath a web covered with refuse and pieces of bark, on bark of shoots of tea-plant (*Thea*), eating right through to the cambium, and thus killing the branch or plant (Antram).

ŒCOPHORIDÆ.

Blastobasis decolor, n. sp.

♂ ♀. 11-15 mm. Head and thorax whitish-ochreous. Palpi whitish-ochreous, irrorated with fuscous except at apex of joints, terminal joint in ♂ stout, tolerably obtuse. Antennæ greyish-ochreous, basal joint whitish ochreous. Abdomen whitish-ochreous, in ♂ with a dark fuscous transverse streak on each segment before margin. Forewings elongate, narrow, moderately pointed, tolerably acute ; whitish-ochreous, partially tinged with brownish, in ♂ thinly, in ♀ more largely sprinkled with dark fuscous ; a curved or obtusely angulated ochreous-whitish fascia at ⅓, followed by more or less dark fuscous suffusion ; stigmata dark fuscous, distinct, plical obliquely before first discal, and touching posterior edge of pale fascia, a larger dark fuscous dot on tornus beneath second discal : cilia whitish-ochreous or whitish-fuscous, somewhat sprinkled with dark fuscous. Hindwings in ♂ pale fuscous, basal third suffused with whitish-ochreous or pale yellowish, in ♀ fuscous, darker towards apex ; cilia whitish-ochreous or whitish-fuscous.

Puttalam, Ceylon, from November to January ; fourteen specimens (Pole).

Blastobasis pulverea, n. sp.

♂ ♀. 14-16 mm. Head ochreous-whitish, crown irrorated with fuscous. Palpi whitish-ochreous irrorated with dark fuscous, terminal joint in ♂ slender, acute. Antennæ pale greyish-ochreous. Thorax ochreous-whitish irrorated with fuscous. Abdomen pale greyish-ochreous, in ♂ with ferruginous segmental bands. Forewings elongate, rather narrow, moderately pointed, apex tolerably obtuse ; grey-whitish, suffusedly irrorated with dark fuscous ; discal stigmata tolerably distinct, round, dark fuscous, at ⅓ and ⅔ respectively ; cilia pale greyish, sprinkled with whitish points, and with a few dark fuscous scales towards base. Hindwings with vein 5 connate with or out of stalk of 3 and 4 ; grey, towards base and in cell pale and subhyaline ; cilia light grey, slightly ochreous-tinged.

India (without further locality) ; four specimens, bred from larvæ feeding on colonies of *Tachardia lacca* (Green).

Hypatima doleropa, n. sp.

♂. 12-15 mm. Head whitish, crown irrorated with dark grey, face sometimes ochreous-tinged. Palpi whitish, irrorated with dark grey except apex of second joint. Antennæ dark grey. Thorax whitish, mixed with pale grey and irrorated with dark grey. Abdomen grey-whitish mixed with grey, segments with ferruginous bands. Forewings elongate, narrow, costa slightly arched, apex round-pointed, termen extremely obliquely rounded ; whitish, irregularly irrorated with dark grey or blackish ; stigmata cloudy, formed of blackish irroration, discal rather large, round, often placed in a longitudinal whitish streak, plical elongate, slightly before first discal; cilia light grey round apex irrorated with whitish and blackish. Hindwings grey, becoming semitransparent towards base ; cilia grey, paler towards tips.

Satpura Range, Khandesh, bred in February ; five specimens (Annandale). "Parasitic in lac," in company with the Noctuid *Eublemma amabilis*" (Annandale).

STENOMIDÆ.

Agriophara byrsina, n. sp.

♂ ♀. 22-25 mm. Head fuscous-whitish, sometimes brownish-tinged. Palpi fuscous-whitish, lower half of second joint suffused with dark fuscous

Antennæ, thorax, and abdomen whitish-fuscous. Forewings elongate, costa moderately arched, apex obtuse, termen rounded, somewhat oblique; pale greyish-ochreous slightly sprinkled with whitish and dark fuscous, sometimes ochreous-tinged; dorsum sometimes suffused with fuscous; basal fourth of costa more or less suffused with dark fuscous; subtriangular spots of dark fuscous suffusion on costa at ½ and ¾; very indistinct traces of suffused fuscous lines from costa at ¼ and the two spots, first hardly traceable, second very irregular, angulated in disc, third curved; first discal stigma sometimes fuscous, second large, dark fuscous; a marginal series of blackish dots round apex and termen: cilia pale greyish-ochreous. Hindwings whitish-grey; cilia pale greyish-ochreous.

Khasi Hills, from July to September; five specimens.

Agriophara minax, n. sp.

♂. 22-25 mm. Head pale brownish-ochreous, sides of face fuscous. Palpi whitish-ochreous, basal half of second joint suffused with fuscous. Antennæ and thorax whitish-ochreous irrorated with fuscous. Abdomen greyish, apex whitish-ochreous. Forewings elongate, costa moderately arched, apex obtuse, termen rounded, rather oblique; whitish-ochreous tinged with brownish and irrorated with fuscous; basal fourth of costa suffused with dark fuscous; a very indistinct irregular line of fuscous suffusion from costa at ¼ to dorsum before middle; a broad oblique fascia of dark fuscous suffusion, sharply defined and pale-edged anteriorly, very undefined posteriorly, from costa about middle, reaching more than half across wing; a suffused fuscous curved line from costa about ¾, almost obsolete on dorsal half; a marginal row of blackish dots round apex and termen: cilia light brownish-ochreous. Hindwings pale grey; cilia pale greyish-ochreous, with grey subbasal line.

Khasi Hills, in July; two specimens.

COPROMORPHIDÆ.

Copromorpha cymbalora, n. sp.

♂ ♀. 13-17 mm. Head and thorax white. Palpi white, sometimes with a few black specks. Antennæ ochreous dotted with black. Abdomen white, on apical half mixed or suffused with grey or dark fuscous. Forewings elongate-triangular, costa gently arched, apex obtuse, termen slightly bowed, little oblique; 7—9 separate; ochreous, more or less suffused with bright fulvous; a white patch occupying basal ⅖ of wing, outer edge straight, vertical; a violet-golden metallic irregular transverse streak near beyond and parallel to edge of this; one or two short violet-golden metallic oblique marks beneath costa beyond this, a striga from ¾ of costa to termen above middle, and a short mark just before apex; area between this striga and the transverse streak occupied by a large roundish fuscous blotch finely irrorated with whitish and crossed by numerous fine incomplete longitudinal black lines, marked on upper edge with two small round violet-golden-metallic spots, on middle of posterior edge with a violet-golden-metallic transverse mark, and crossed below middle by an irregular bar of ground-colour containing four small round violet-golden metallic spots partly margined with irregular black marks: cilia purplish-grey with two dark fuscous shades. Hindwings white; a broad blackish terminal fascia irregularly attenuated downwards, on lower third of termen very narrow or absent; cilia grey with blackish subbasal line, becoming white on lower half of termen.

Khasi Hills, from June to September; five specimens.

CHLIDANOTIDÆ.

Trymalitis cataracta, n. sp.

♂. 16-19 mm. Head white, crown mixed with fuscous. Palpi white, upper surface dark fuscous except apex of joints. Thorax white, more or less mixed on back with light fuscous, sometimes speckled with blackish. Abdomen pale whitish-ochreous. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen obliquely rounded, slightly indented beneath apex; white; a few fuscous dots on costa; blackish subcostal dots near base and before middle; a streak of suffused fuscous strigulation occupying dorsal fourth from base almost to tornus, and a similar but fainter and less defined streak extending from dorsum beyond middle to apex of wing, marked with two or three blackish dots and a yellowish discal dot at end of cell; a yellow-ochreous apical spot, enclosing a white longitudinal mark; a submarginal series of blackish dots, followed by a marginal series of small grey spots: cilia white, with two shades of fuscous or dark fuscous irroration. Hindwings and cilia whitish-grey, slightly yellowish-tinged.

Maskeliya, Ceylon, in October, November and March; five specimens (de Mowbray). Closely allied to *T. margarias*, but with the colouring of oblique streak much reduced; easily distinguished by having posterior half of costa white with at most one or two minute fuscous dots, whereas in *margarias* it is ochreous strigulated with white.

PLUTELLIDÆ.

Yponomeuta corpuscularis, n. sp.

♂. 27 mm. Head grey-whitish, forehead with two black dots, centre of crown with some black scales. Palpi grey-whitish, base of terminal joint with a blackish dot. Antennæ grey. Thorax grey-whitish, with dots on shoulders, three antemedian, two postmedian dots, and two at posterior extremity black. Abdomen grey. Forewings elongate, narrow, costa gently arched, apex obtuse, termen obliquely rounded; grey, irregularly strewn with small white dots, thickest in disc anteriorly, most thinly towards costa between middle and ⅚; six longitudinal series of small black dots, first of nine dots beneath costa from base to middle, second of ten dots from near base to ¾, third of three dots before middle and two towards apex, fourth median, of seven dots from near base to middle and three posteriorly, fifth above fold, of twelve or thirteen dots, sixth of ten dots; three additional dots before termen between fourth and fifth rows; a small white spot on costa towards apex: cilia grey, towards base mixed with white. Hindwings and cilia slaty-grey; a moderate roundish rather undefined transparent basal patch.

Nilgiri Hills (6,000 feet), in May; one specimen (Andrewes).

Anticrates asterias, n. sp.

♂. 16 mm. Head, palpi, antennæ, thorax, and abdomen dark fuscous; palpi with several white dots; antennæ with a shining white subbasal mark above. Forewings elongate, costa moderately arched, apex obtuse, termen sinuate, oblique; 2 from before angle, 3 and 4 approximated, 7—9 separate; dark fuscous tinged with bronze, strewn throughout with numerous pale violet-blue-metallic dark-edged dots, tending to form transverse series, especially two angulated series beyond middle, and one along termen: cilia light ochreous-yellow, basal half bronzy-fuscous, towards tornus more blackish. Hindwings dark fuscous, cilia whitish-fuscous basal half dark fuscous.

Khasi Hills, in June; one specimen.

TINEIDÆ.

Dacryphanes, n. g.

Head with loosely appressed hairs; ocelli present; tongue absent. Antennæ ⅘, in ♂ moderately ciliated (1), basal joint short, without pecten. Labial palpi moderately long, curved, ascending, thickened with dense scales, second joint rough beneath, with an exterior series of projecting bristles, terminal joint rather short, obtuse. Maxillary palpi several-jointed, folded. Posterior tibiæ with appressed scales. Forewing with 1 b furcate, 2 from near angle, 7 to apex, 11 from before middle. Hindwings 1, elongate-ovate, cilia ¼; 3 and 4 approximated at base, 5—7 parallel.

Intermediate in some respects between *Tinea* and *Setomorpha.*

Dacryphanes cyanastra, n. sp.

♂ ♀. 15-18 mm. Head and palpi dark ochreous-fuscous. Antennæ, thorax, and abdomen dark fuscous. Anterior legs spotted with silvery-white. Forewings elongate, posteriorly somewhat dilated, costa moderately arched, apex rounded, termen obliquely rounded; dark fuscous; six indeterminate groups of blue-metallic or violet-metallic dots, sometimes surrounded by an indefinite cloudy paler suffusion, *viz.*, basal, towards costa before middle, towards middle of dorsum, towards costa about ¾, tornal, and apical: cilia rather dark ochreous-fuscous. Hindwings rather dark bronzy-fuscous, darker towards apex; cilia fuscous, with dark fuscous basal line. Forewings in ♂ beneath with expansible subcostal fringe of hairs before middle.

Khasi Hills, in July and August; twenty specimens.

Struthisca mysteris, n. sp.

♂ 19-22 mm., ♀ 28-32 mm. Head light ochreous-yellowish, lower part of face dark fuscous. Palpi very short, loosely scaled, fuscous. Antennæ fuscous, basal joint pale yellowish, pectinations in ♂ 12. Thorax light fuscous. Abdomen light greyish-ochreous. Forewings elongate, in ♂ moderate, in ♀ narrower, costa moderately arched, apex obtuse, termen obliquely rounded; 5 absent, 8 and 9 stalked; pale fuscous, with scattered cloudy dark fuscous strigulæ; these cause obscure indications of a cloudy dark transverse mark from disc before middle to dorsum, preceded by faint pale suffusion: cilia pale fuscous or greyish-ochreous. Hindwings thinly scaled, grey ; cilia light greyish-ochreous.

Madulsima and Peradeniya, Ceylon, from July to September ; six specimens (Vaughan, Green).

Struthisca zygitis, n. sp.

♂ 13-14 mm., ♀ 19-22 mm. Head and thorax whitish irrorated with fuscous, lower half of face fuscous. Palpi short, slender, fuscous, apex of joints whitish. Antennæ whitish sprinkled with fuscous, pectinations 2½. Abdomen light greyish-ochreous. Forewings elongate, moderate, costa moderately arched, more strongly in ♀, apex obtuse, termen rounded, rather strongly oblique ; 9 absent ; whitish, sometimes partially tinged with fuscous, strewn throughout with fuscous or dark fuscous strigulæ ; an irregular transverse median fascia, and a spot beneath costa at ⅔, more or less indicated with fuscous suffusion, but usually very ill-defined : cilia whitish, sprinkled with pale fuscous. Hindwings and cilia pale fuscous or whitish-fuscous.

Puttalam, Ceylon, from September to June ; ten specimens (Pole).

Struthisca charadrias, n. sp.

♂ 18-23 mm., ♀ 28-31 mm. Head and thorax light fuscous, sprinkled with whitish. Palpi very small, slender, fuscous. Antennæ whitish, pectinations in ♂ 5, lined with fuscous. Abdomen pale whitish-fuscous. Forewings elongate, rather narrow, rather dilated posteriorly, costa posteriorly moderately arched, apex round-pointed, termen very obliquely rounded ; all veins present, separate ; whitish finely irrorated with fuscous, sometimes forming indistinct strigulæ ; the absence of irroration forms a more or less distinct suffused white median streak from near base to ⅘, costal area above this more or less suffused with fuscous : cilia whitish-fuscous. Hindwings and cilia fuscous-whitish.

Hambantota, Ceylon, from June to August ; ten specimens (Pole).

Saphenautis, n. g.

Head loosely rough-scaled ; ocelli present ; tongue absent. Antennæ ½, in ♂ biciliated with fascicles. Labial palpi moderate, porrected or ascending, loosely scaled, obtuse. Maxillary palpi obsolete. Posterior tibiæ clothed with long hairs. Forewings with 1b furcate, 2 from towards angle, 7 to apex or termen, 8 stalked with 7 or absent, 11 from before middle. Hindwings 1, elongate-ovate, cilia ⅓—1 ; 2—7 tolerably parallel.

Type *S. camerata*. Allied to *Melasina*, from which it differs essentially by the antennæ not being pectinated in ♂.

Saphenautis camerata, n. sp.

♂. 12-15 mm., ♀ 21-23 mm. Head, palpi, antennæ, thorax, and abdomen pale whitish-ochreous ; basal half of palpi mixed with blackish ; shoulders with a blackish-fuscous spot. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen very obliquely rounded ; 8 absent ; pale whitish-ochreous ; markings rather dark fuscous edged with black ; an irregular fascia near base, not black-edged anteriorly ; an irregular fascia before middle, anterior edge concave, posterior angularly prominent in middle; a subquadrate spot on costa about ⅔, and narrow sometimes nearly obsolete spot on tornus opposite it; sometimes two undefined dots on costa and termen near apex: cilia pale whitish-ochreous. Hindwings in ♂ ochreous-whitish more or less tinged with grey, in ♀ pale grey; cilia pale whitish-ochreous.

Maskeliya, Ceylon (Pole); N. Coorg (Newcome); in April, May, October, and November, nine specimens.

Sapheneutis marmarurga, n. sp.

♂ ♀. 15-20 mm. Head ochreous-yellow. Palpi fuscous, towards apex pale yellowish. Antennæ pale ochreous, ciliations in ♂ 1. Thorax light purplish-bronzy, mixed with blackish and sometimes with yellow-ochreous with posterior crest. Abdomen whitish-ochreous more or less suffused with grey. Forewings elongate, posteriorly rather dilated, costa moderately arched, apex obtuse, termen straight, oblique; 7 and 8 long-stalked, 9 sometimes out of 7 near base; white, in ♂ sprinkled with ochreous, especially posteriorly, and more or less sprinkled with blackish, in ♀ much more largely suffused and strigulated with ochreous-fuscous or purplish-fuscous and irrorated with blackish, so as to obscure ground colour except on a fascia following basal patch and dilated towards costa; markings slaty-purplish or purplish-fuscous irrorated with black, *viz.*, a basal patch with outer edge running from ¼ of costa to ⅖ of dorsum, slightly curved, and a transverse or subtriangular blotch on costa somewhat beyond middle, reaching half across wing: cilia fuscous sprinkled with blackish. Hindwings in ♂ pale grey, brassy-tinged, in ♀ grey; cilia ochreous-whitish more or less tinged with grey, usually with grey subbasal line.

Maskeliya, Ceylon, in February, March, and June; sixteen specimens (Pole).

Sapheneutis metacentra, n. sp.

♂. 14-18 mm., ♀ 24-26 mm. Head rather dark fuscous. Palpi ascending, dark fuscous, apex of second and terminal joints light greyish-ochreous. Antennæ pale greyish-ochreous. Thorax fuscous-whitish, anteriorly narrowly suffused with dark fuscous. Abdomen pale greyish-ochreous. Forewings elongate-oblong, costa moderately arched towards extremities, apex rounded, termen obliquely rounded; 7 and 8 stalked; very pale greyish-ochreous, with some scattered dark fuscous strigulæ, especially towards termen; a large blackish dot of partially raised scales in disc at ⅔: cilia ochreous-whitish. Hindwings grey, thinly scaled; cilia grey-whitish, with two grey shades.

Puttalam, Eppawela, Wellawaya, Maskeliya, and Madulsima, Ceylon, from September to November and in May (Pole, Green, Vaughan).

Melasina epiclera, n. sp.

♂. 16-18 mm., ♀ 18-20 mm. Head ochreous-whitish, hairs somewhat appressed, lower part of face fuscous. Palpi very small, fuscous. Antennæ in ♂ ochreous-whitish, pectinations 5, in ♀ fuscous. Thorax ochreous-whitish, in ♀ more or less infuscated. Abdomen whitish-fuscous, in ♀ with dense ochreous-whitish anal hairs. Forewings rather elongate, more so in ♀, costa gently arched, apex obtuse, termen obliquely rounded ; 8-10 r approximated ; in ♂ clear whitish with some scattered fuscous strigul ♀ light fuscous somewhat mixed with darker ; in ♂ one or two small towards base, a moderate straight fascia from middle of costa to beyond of dorsum, and a transverse mark from costa at ⅘ reaching half acro fuscous, in ♀ these markings are more or less indicated by darker f suffusion but very undefined ; a terminal row of fuscous dots : cili ochreous-whitish, becoming more ochreous towards base, in ♀ whitish-f Hindwings pale fuscous ; cilia as in forewings.

Palni Hills (6,000 feet) ; four specimens (Campbell).

Melasina autopetra, n. sp.

♂. 18-21 mm., ♀ 25-29 mm. Head light ochreous-yellowish. moderate, light fuscous. Antennæ pale greyish-ochreous, towards base i cated, pectinations, in ♂ 6. Thorax light fuscous, with posterior Abdomen light greyish-ochreous, apex whitish-ochreous. Forewings elo in ♂ moderate, in ♀ narrower, costa moderately arched, apex rou termen obliquely rounded ; 8-10 rather approximated ; light greyish-ochre finely irrorated with fuscous, in ♂ with indications of darker strigulæ, in almost uniform ; in ♂ sometimes indistinct dark dots along posterior part costa and termen : cilia pale greyish-ochreous irrorated with fuscous. Hin wings whitish-fuscous ; cilia whitish-ochreous, with two pale fuscous shad

Puttalam, Ceylon, in September and October ; eleven specimens (Pole).

Melasina expedita, n. sp.

♂. 24-27 mm., ♀ 38 mm. Head shortly scaled, ochreous-yellow, lo third of face dark fuscous. Palpi moderate, dark fuscous, terminal joint pa yellowish beneath. Antennæ ochreous-yellow, pectinations in ♂ 3. Thor whitish-ochreous, anteriorly suffused with blackish-fuscous. Abdomen whitish ochreous, in ♀ with long anal tuft. Forewings elongate, moderate, somewha dilated posteriorly, costa moderately arched, apex obtuse, termen obliquel rounded ; 8 and 9 stalked, 10 approximated ; whitish-ochreous, with scattere dark fuscous strigulæ, in ♀ largely suffused with light fuscous ; a well-defined dark fuscous spot occupying basal fifth of costa ; a narrow dark fuscous fascia from ⅖ of costa to beyond middle of dorsum ; a cloudy dark fuscous spot beneath costa at ¾ ; in ♀ these markings are more obscure : cilia whitish-ochreous, in ♀ fuscous-tinged. Hindwings light grey ; cilia ochreous-grey-whitish, with a fuscous subbasal line.

N. Coorg (3,000 feet), in August ; four specimens (Newcome).

Melasina leucosceptra, n. sp.

♂. 25-28 mm. Head and whitish brownish, thorax with pos dian fold from base to beyond middle ; a white spot in cell and streaks en veins and along dorsum and termen more or less developed, very le in extent and sometimes partially confluent : cilia pale whitish-us, somewhat sprinkled with fuscous. Hindwings ochreous-whitish, r finely sprinkled with pale fuscous ; cilia ochreous-whitish, sometimes ed with pale fuscous.

alam, Ceylon, in October ; five specimens (Pole).

sina isopeda, n. sp.

20-26 mm. Head fuscous-whitish mixed with fuscous. Palpi mode-ascous, apex fuscous-whitish. Antennæ ochreous-whitish, pectinations aorax fuscous mixed with fuscous-whitish. Abdomen whitish-fuscous. ings elongate, costa gently arched, apex obtuse, termen obliquely round--10 approximated ; whitish-fuscous sprinkled with dark fuscous, and a with numerous small cloudy dark fuscous dots, sometimes coalescing m longitudinal streaks in disc and between veins posteriorly ; a larger fuscous dot in disc at ⅔ : cilia fuscous-whitish with two fuscous shades. dwings pale fuscous ; cilia fuscous-whitish, with light fuscous subbasal

uddapah, Palni Hills (6,000 feet), and Bombay, in May and June ; four ecimens (Campbell).

Melasina pericrossa, n. sp.

24-27 mm. Head and palpi fuscous mixed with dark fuscous, palpi ate. Antennæ whitish-ochreous sprinkled with dark fuscous, pectina-. Thorax fuscous mixed with white and dark fuscous. Abdomen light ecous. Forewings elongate, moderate, costa moderately arched, apex round-termen obliquely rounded ; 8-10 approximated ; fuscous, irrorated with dark scous, costa and dorsum except basal third, and termen suffused with white ad strigulated with dark fuscous, costa posteriorly spotted with dark fuscous; broad dark fuscous submedian suffusion from base to ⅗, interrupted by a hitish spot before middle ; an undefined discal spot of whitish suffusion at ⅗, ollowed by a spot of dark fuscous suffusion ; a series of undefined spots of dark fuscous suffusion preceding a suffused white terminal streak : cilia ochreous-whitish indistinctly barred with fuscous, with a dark fuscous subbasal ine. Hindwings fuscous ; cilia pale whitish-ochreous, with fuscous sub-basal ine.

Sikkim (600 feet), in May ; three specimens (Dudgeon).

Me asina [illegible], n. sp.

♀ 50 mm. Head pale brownish-ochreous, crown sometimes Palpi [illegible], dark fuscous, apex whitish- 5. Thorax pale brown- especially long stalk ; pale brownish-ochreous, irregularly sprinkled with blackish-fuscous, in disc and towards dorsum and termen more or less suffused with whitish in ♂ ; basal area more or less suffused with dark fuscous ; a fuscous band irregularly suffused with blackish running from upper portion of basal patch to near dorsum beyond middle, its lower edge there rather obtusely angulated and running almost straight to apex ; a dark fuscous costal spot beyond middle and a smaller one at ¾; in ♀ these markings are very obscure and ill-defined : cilia pale whitish-ochreous mixed with fuscous, obscurely barred with darker fuscous. Hindwings rather light fuscous; cilia light fuscous, base whitish-ochreous.

Madulsima, Haputalte, and Peradeniya, Ceylon, from June to August, and in February (Vaughan, Pole, Alston, Green) ; seven specimens. Differs from *M. Thwaitesii* (to which it is very closely allied) by different form of dark band, which in *Thwaitesii* forms *two* obtuse angles towards dorsum ; and by neuration of forewings, since in *Thwaitesii* the secondary cell is large, 9 and 10 approximately connate from its angle or in ♀ short-stalked ; this is due to the position of cross-vein, which in *Thwaitesii* is in a line with posterior margin of cell, whilst in *anasactis* it is very much retracted towards base.

Melasina æthalea, n. sp.

♂. 30-34 mm., ♀ 46 mm. Head and palpi ochreous-yellow, in ♀ somewhat mixed with dark fuscous, palpi rather short, densely scaled, in ♀ hairy. Antennæ in ♂ ochreous mottled with blackish, pectinations 6, in ♀ wholly clothed with loose dark brown and black scales. Thorax and abdomen dark brown. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen obliquely rounded ; 8 approximated, 9 and 10 short stalked ; in ♂ dark fuscous finely irrorated with whitish, in ♀ paler, strewn with blackish-fuscous strigulæ ; a dark fuscous transverse fascia-like blotch from middle of dorsum, reaching about half across wing ; a similar blotch from middle of costa directed towards tornus, reaching more than half across wing ; costa posteriorly more or less spotted alternately with pale ochreous-yellowish and dark fuscous ; two or three dark fuscous subterminal spots sometimes united into an incomplete fascia : cilia dark fuscous, base mixed with whitish-fuscous. Hindwings and cilia blackish-fuscous, cilia round apex and upper half of termen pale ochreous-yellowish except at base.

Khasi Hills ; three specimens.

Melasina stratifica, n. sp.

♂. 32-36 mm. Head pale brownish-ochreous, sometimes mixed with dark fuscous on crown. Palpi moderate, rough-scaled, dark fuscous, apex whitish-ochreous. Antennæ whitish-ochreous, pectinations 7. Thorax pale brownish-ochreous mixed with brown and dark brown, with posterior crest tipped with blackish-fuscous. Abdomen light brownish-ochreous. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen obliquely rounded ; 8 approximated, 9 and 10 stalked ; pale whitish-ochreous, somewhat sprinkled with fuscous and blackish ; markings fuscous, suffusedly mixed with blackish, ill-defined; a suffused basal patch; two moderate straight parallel fasciæ, first from ⅓ of costa, connected on costa with basal patch, not crossing fold, second from middle of costa to tornus; a short inwardly oblique mark from costa before apex: cilia ochreous-whitish, more ochreous-tinged on basal half, indistinctly barred with grey and blackish. Hindwings whitish-fuscous; cilia pale whitish-ochreous, with an indistinct pale fuscous line.

Maskeliya and Madulsima, Ceylon, in January, February, and May; eight specimens (de Mowbray, Vaughan).

BLOOD-SUCKING INSECTS AND TROPICAL DISEASES.

The importance of blood-sucking insects and other animals as possible disseminators of pathogenic organisms being now universally recognised, it is absolutely essential, firstly that medical men and others engaged in improving the sanitation of tropical countries should have the means of determining correctly the names of blood-sucking species with which they may come into contact; and secondly that a well-preserved collection of modern specimens should be available in London for comparison.

The British Museum has already dealt with the Mosquitoes and Tsetse-flies, and it is now proposed to publish on similar lines a further series of monographs on the other blood-sucking forms. The material at present at our disposal, however, is insufficient for this purpose, and it is therefore hoped that all medical men and naturalists residing in British Colonies, or in the tropics in any part of the world, will make special endeavours to obtain specimens and send them addressed to the DIRECTOR, BRITISH MUSEUM (NATURAL HISTORY), CROMWELL ROAD, LONDON, S. W., together with notes on the names, habits, and distribution of the insects. This appeal is made especially to the medical officers of the Foreign and Colonial Services, to the medical officers of the Navy, Army, and Indian Services, and to all official representatives of H. M.'s Government in foreign parts.

The accompanying pamphlet, which has been prepared in order to assist those who may be willing to help the Museum in this way, is mainly devoted to the blood-sucking Flies (Diptera), and contains a resumé of what is known of their appearance, habits and life-history, with illustrations of typical forms, and full directions as to the collection and transmission of specimens to England.

When a collection is despatched, a separate letter of advice stating the fact should always be sent; the expense of sending collections to the Museum, by parcel post or otherwise, will be refunded. All collections forwarded to the Museum and addressed as stated will promptly be acknowledged, and so soon as sufficient material has been obtained the preparation of the first monograph will be commenced.

E. RAY LANKESTER, *Director*,

British Museum (Natural History), Cromwell Road,

10th December 1905. LONDON, S.W.

BLOOD-SUCKING FLIES, TICKS, &c., AND HOW TO COLLECT THEM.

IN view of the possible importance of Blood-sucking Arthropoda, other than Mosquitoes and Tsetse-flies,* in the dissemination of diseases due to micro-organisms, in addition to the knowledge that certain maladies are actually carried by Ticks, it is proposed to publish a series of monographs in which these creatures and their bionomics shall be fully and accurately described and illustrated. Since, however, the material already available in the collection of the British Museum is insufficient for this purpose, *carefully collected and properly labelled* specimens of Blood-sucking Flies, Ticks, etc., are now urgently required from all parts of the world. With a view to assist medical men and others who may be willing to help in the collection of specimens, the following pages contain—(i) Notes on Blood-sucking Flies, other than Mosquitoes; (ii) Directions as to the way in which these insects should be collected and forwarded to England; (iii) Notes on collecting Fleas, Bugs, and Ticks.

PART I.

Notes on Blood-sucking Flies, other than Mosquitoes.

HOW TO DISTINGUISH FLIES (DIPTERA) FROM OTHER INSECTS.

The presence of a pair of little knobbed organs (the halteres or balancers) behind the wings, and the absence of caudal filaments distinguish Flies (Diptera) from the winged males of Coccidæ (Scale-insects). From all other insects Diptera may be distinguished by the fact that they possess *only one pair of wings*.† Thus, besides ordinary flies, such as Blue-bottles and House-flies (*Muscidæ*), the Order also includes Midges (*Chironomidæ*), Gnats or Mosquitoes (*Culicidæ*), Daddy-long-legs (*Tipulidæ*), Horse-flies (*Tabanidæ*), etc.

Blood-sucking Flies: Their Appearance, Life-history, and Habits.

With the exception of the Gnats or Mosquitoes (*Culicidæ*), blood-sucking species of Diptera occur, so far as at present known, only in the following families:—Chironomidæ, Blepharoceridæ, Simulidæ, Psychodidæ, Tabanidæ, Leptidæ, Muscidæ, and Hippoboscidæ. The enormous majority of Blood-sucking Diptera belong to the family Tabanidæ (Horse-flies or Dun-flies, Clegs, Serut-flies), in which the blood-sucking habit is universal (or practically so) in the female sex; in the other families enumerated, if we exclude the Simulidæ and Hippoboscidæ, the habit is exceptional, and the species concerned are comparatively few. As a rule, the blood-sucking habit is confined to the females, and it may be noted as a somewhat remarkable fact, that a large proportion of the species have aquatic larvæ.

Chironomidæ (Midges):—genus *Ceratopogon* and its allies.

The blood-sucking species at present known are confined to the subfamily

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* "A Monograph of the Culicidæ or Mosquitoes" (3 Vols. and 1 Vol. of plates; 1901-1903), by F. V. Theobald, and "A Monograph of the Tsetse-flies" (1903), by E. E. Austen, have already been published by the Trustees of the British Museum.

† For present purposes it is unnecessary to take into account certain aberrant *wingless* forms, which in the majority of cases do not suck blood. In some of these forms even the halteres are absent.

Ceratopogoninæ, which is represented throughout the world, and at the present time comprises nearly four hundred described species. The blood-sucking habit, however, is by no means universal even among *Ceratopogoninæ*, and is limited to the female sex.

Appearance.—Extremely small flies, as a rule (in the case of species known to suck blood), not exceeding 1½ or 2 mm. in length, though the males are usually somewhat larger than the females; generally blackish or dark grayish-brown in colour, but the abdomen of the female, after feeding, often rosy, owing to the contained blood. The wings when at rest are carried flat, closed one over the other like the blades of a pair of scissors; in many species they are hairy, and they are often speckled or mottled with grayish-brown blotches. The sexes can be distinguished owing to the possession by the males of tufted antennæ and a more elongate shape.

Life-history.—As a general rule, the larvæ of naked-winged species of *Ceratopogoninæ* are aquatic, those of hairy-winged species terrestrial. The eggs of aquatic species are laid in floating algæ in star-shaped clusters containing from one hundred to one hundred and fifty. The larvæ of these species are whitish worm-like creatures, with long narrow heads, and live in the masses of Confervæ floating on the surface of stagnant pools and ditches. They are without prolegs on the prothoracic segment, and progress with a serpentine motion. The pupa, which is shorter than the larva, with a conspicuous pair of respiratory horns on the thorax, is brownish in colour, possesses little power of movement, and remains at the surface of the water. The larvæ of the hairy-winged species live under the damp bark of dead trees, in weeping spots on tree-trunks, and in decaying vegetable matter generally, such as manure, rotting fungi, etc. These terrestrial larvæ are usually shorter than the aquatic ones, and do not move in serpentine fashion, but are provided with a cleft proleg on the underside of the prothoracic segment while the head and body segments also bear peculiar lancet-shaped hairs and spines. Serpentiform larvæ, which have produced midges with hairy wings, have, however, been found in the sap saturating diseased bark on tree-trunks.

Habits of the perfect insects.—In spite of their small size, the females of certain species of *Ceratopogoninæ* are among the most irritating and bloodthirsty of insects, both in the tropics and also in temperate regions. Writing of a species found in Uganda (see fig. 1), a recent observer* says: "It is very common in many places, usually near habitations. This minute fly can pass through the finest mosquito netting; muslin I have not tried. It bites terrribly, leaving an irritating wheal, which itches for days. It makes a sharp, short, peevish buzz when settling, fully as loud

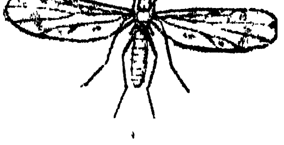

FIG. 1.—*Ceratopogon sp.* ♀. Uganda. (× 12.)

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* Dr. Cuthbert Christy, "Reports of the Sleeping Sickness Commission," No. III., pp. 39—40 (London; Harrison & Sons, November, 1903)

as a mosquito. It attacks the wrists chiefly, but is able to pass beneath a sheet and bite the ankles and feet. Many were frequently found full of blood on turning down the bed-clothes. I have met with a similar fly, with the same habits, at Ahmednuggar (Bombay Presidency), India.'' In some places, at any rate, midges torment domestic animals in addition to human beings. *Oecacta furens*, Poey, which is found in Cuba (where it is known as the *jejen*), and is said also to occur in Jamaica and Mexico, chiefly haunts wooded spots near the sea, and is a scourge of man and animals : in New Mexico *Tersesthes torrens*, Towns., has been caught attacking horses.

Blepharoceridæ:—genus *Curupira*.

No specimens of this genus have actually been observed sucking blood and its inclusion among blood-sucking Diptera is due to the statement by Fritz Müller that a certain number of the females of the only species at present known, *Curupira* (*Paltostoma*) *torrentium*, F. Müll., have mouth-parts of the blood-sucking type, while other females agree with the males in possessing mouth-parts adapted for feeding upon the nectar of flowers. Müller's conclusion that the two kinds of female both belong to the same species, which therefore presents a striking instance of dimorphism in the female sex, requires confirmation, and it may even ultimately be found that the supposed blood-sucking females merely prey upon other insects and do not feed upon mammalian blood. *Curupira torrentium* occurs in Brazil.

Appearance.—Gnat-like flies, varying from about 4 to 7 mm. in length, with strongly iridescent wings, which are marked with a secondary network of crease-like lines in addition to the veins.

Life-history.—The larvæ are curious wood-louse-like creatures, living in swiftly flowing streams and torrents, in which they attach themselves to bare rocks and stones by means of a row of median ventral suckers. The ordinary segmentation is not visible, but the sides of the body are scolloped out into a series of prominent lobes. The pupa, which bears a pair of respiratory horns in front, is strongly convex above and flattened beneath ; it is found with the larvæ, so firmly attached to the rocks, apparently by means of a chitinous exudation from the underside, that it is not easy to remove it uninjured.

Habits of the perfect insects.—At present unknown. In all probability the males, like those of European species belonging to this family, dance in swarms in the air over the streams in which the preliminary stages are passed.

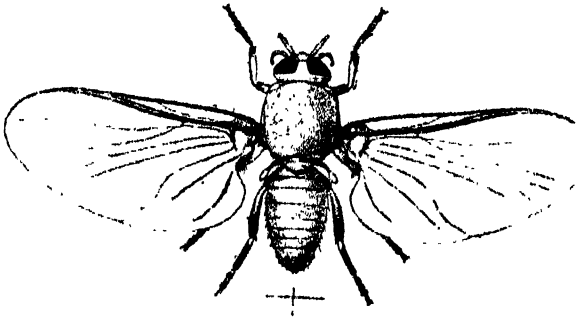

FIG. 2.—*Simulium venustum*, Say—(*reptans*, L.) ♀ N. America. (× 12.)

Simuliidæ (in India known as *Sand-flies*, *Pipsa*, or *Potû flies*; in British Columbia as *Brûlots*, by the French Canadian trappers; in the United States as *Black flies*, *Buffalo-gnats*, and *Turkey-gnats*).

This family consists of the single genus *Simulium*, which is universally distributed, and of which some seventy species, difficult to distinguish one from another, have been described up to the present time. The females of some of these flies, which are among the most dreaded of all blood-sucking Diptera, sometimes occur in enormous swarms, and by their attacks upon horses, mules and cattle, especially in certain parts of the United States, occasion great losses among these animals, besides frequently molesting human beings. In the district of South Hungary called the Banat the Columbacz Midge (*Simulium columbaczense*, Schonb.) has been notorious for more than a hundred years, owing to the destruction caused by it among cattle.

Among the foot-hills of Himalayas in North Lakhimpur, Assam, where the flies are locally called "Dam Dims," the poisonous bites of *Simulium indicum*, Becher, are troublesome to tea-coolies, and in the Western Himalayas during the hot season "Potu" flies are a well-known scourge; it is stated that when the Chakrata-Saharanpur road was under construction numbers of the coolies employed on the work died from the effects of their bites.

Appearance.—Small black or grayish flies, varying in length from 1½ to 4 mm. according to the species, with a conspicuously humped thorax, short straight antennæ, delicate iridescent wings, stout legs, and with the proboscis not projecting. In the male the eyes appear to occupy the whole of the head, and meet in the middle line above; in the female they are smaller and separate.

Life-history.—The preliminary stages are passed in running water. The eggs are deposited in a compact layer or gelatinous mass on stones or plants close to the water's edge. The larval stage lasts for about four weeks in the summer in temperate climates, though longer in cold weather, and the winter is passed in this state. According to Johannsen, the full-grown larva of even the largest American species does not exceed 15 mm. in length. In shape the larva is somewhat cylindrical, broadest posteriorly, where it is attached by means of a sucker to a stone, the stem of a water-plant, a dead leaf, or other object. The larva is able to shift its position by crawling in a looping fashion but usually remains in a more or less erect attitude. It feeds on algæ, diatoms, and parts of phanerogamous plants, which are brought to the mouth by means of the currents set up by two broad fan-like organs situated upon the head. In colour the larva varies according to the species, and perhaps also to some extent in accordance with its food, from deep shining black to yellow or dark green. When mature, the larva spins a silken cocoon, within which it pupates and in which the pupa remains motionless, breathing by means of a pair of branched respiratory filaments which project from behind the head. About a week is occupied in the pupal stage, and then the perfect insect, making its escape through a rent in the back of the thorax, ascends to the surface in a bubble of air, and makes its way to some support on which it rests until its tissues are sufficiently hardened to enable it to fly.

Habits of the perfect insects.—The males, which are incapable of sucking blood, are fond of dancing in the sun in swarms at some height in the air; the females usually remain at a lower level. In attacking horses and cattle they show a great fondness for the inside of the ears ; but they also devote themselves to any part of the body where the skin is thin and not well protected by hair: in the case of human beings, they frequently attack the corners of the eyes. In Uganda, according to Dr. Christy* a species of *Simulium* occurs in a " belt " about 12 or 15 miles in length, by 3 or 4 miles in width, on the right bank of the Nile. " In this area the flies swarm at certain seasons in millions," and become such a pest that the natives are forced to leave their plantations. " The bite of this small fly," adds Dr. Christy, " is a very severe one, and causes a wheal which itches intolerably, and is marked by a large drop of blood."

sychodidæ, genus *Phlebotomus* (in the Sudan and Ceylon called *Sand-flies*).

In this family the blood-sucking habit is altogether exceptional, being confined to the genus *Phlebotomus*† of which only three or four species, which occur in Southern Europe, the Mediterranean Sub-Region, the Anglo-Egyptian Sudan, and Ceylon, are at present known. It is probable that the females alone suck blood.

Appearance.—Small yellowish-brown flies from 1¼ to 2 mm. in length, with the body and wings densely clothed with long hair. Antennæ, palpi, and legs long ; proboscis straight, projecting vertically beneath the head. Abdomen of the female roseate when full of blood. Care must be taken not to confuse with *Phlebotomus* the harmless species belonging to other genera of Psychodidæ, all of which are small, densely hairy, moth-like flies, but with the proboscis scarcely, if at all, visible.

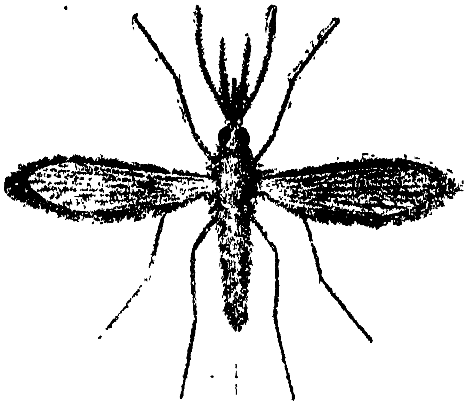

FIG. 3.—*Phlebotomus* sp. ♀ Kassala, Sudan.
(× 12.)

Life-history—Almost unknown. The preliminary stages, however, are passed in water or in liquid filth, as in cesspools.

Habits of the perfect insects.—According to Rondani, in Northern Italy, *Phlebotomus papatasii* is found on the higher slopes of the hills as well as in the marshy plains. As evening approaches, the males very often, the females more rarely, are found on windows. *Phlebotomus minutus* appears to be more confined to the low ground near streams, and to enter houses less frequently. Writing of *Phlebotomus papatasii* as met with in Sevastopol, Mr. Robert Erskine,

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* *Loc. cit.*, p. 40.

† Since this was written the Rev. A. E. Eaton has stated that in England he has observed blood in the abdomen of *Sycorax silacea*, Hal., and has made a similar observation in Algeria in the case of an undescribed species of the same genus. Of course the blood may not have been human.

H. B. M. Vice-Consul, states that it "is common in summer, and is found all over the town, principally in rooms," and that "its bite is very painful, especially to newcomers." In Ceylon, according to Mr. E. E. Green, a species of *Phlebotomus* is sometimes more troublesome even than mosquitoes.

Tabanidæ (*Horse-flies* or *Breeze flies*: in Great Britain certain species are also known as *Dun-flies*, *Clegs*, and *Stouts*; sometimes called *Gadflies*: on the Upper Nile termed *Serut-flies*, and in West Africa *Mangrove flies*—a designation however, which also includes Tsetse-flies).

As already stated, the enormous majority of blood-sucking Diptera belong to this family, in which the blood-sucking habit is (with the possible exception of certain species of *Pangonia*) universal in the female sex. The Tabanidæ are world-wide in their distribution, and are among the largest of all families of Diptera, the total number of species described at the end of the year 1902 being no less than 1,540. The majority of the species that have hitherto attracted attention by reason of their bloodthirsty habits belong to one or other of the four principal genera, *Tabanus*, *Pangonia*, *Hæmatopota*, and *Chrysops*. Of these *Tabanus* includes 908, *Pangonia* 255, *Chrysops* 160, and *Hæmatopota* 62 species. It is possible that more thorough knowledge may enable

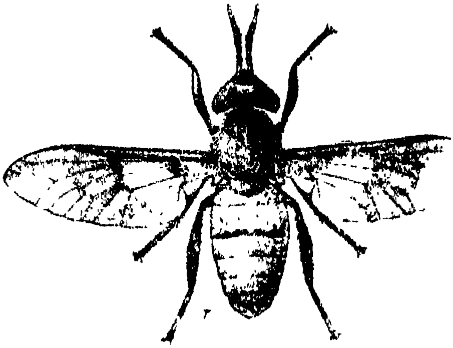

FIG. 4.—*Chrysops fixissimus*. Walker, ♀. Singapore, Borneo.
(× 3.)

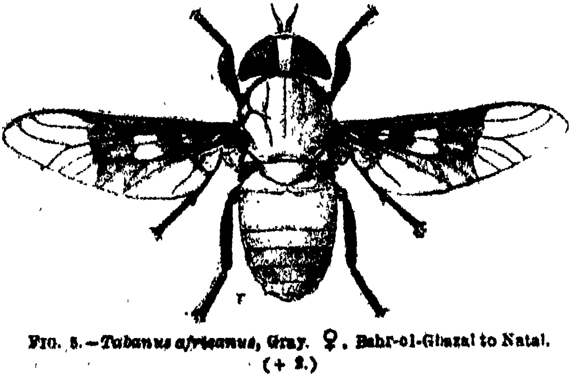

FIG. 5.—*Tabanus africanus*, Gray. ♀. Bahr-el-Ghazal to Natal.
(× 2.)

some of these genera to be broken up, although the details of structure within each genus are remarkably uniform.

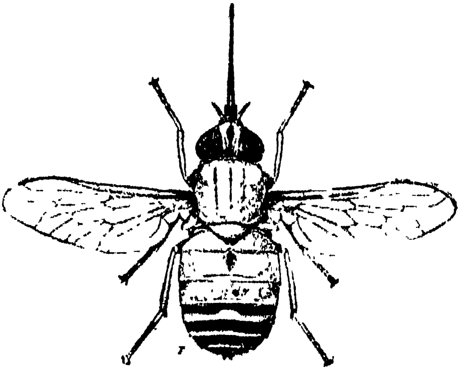

FIG. 6.—*Pangonia magrettii*, Bezzi. ♀ Kassala, Sudan. (× 2).

Appearance.—Bulky-bodied flies, ranging in length from about 6 mm. in the case of a small species of *Chrysops* (fig. 4), to more than an inch in that of the largest species of *Tabanus* (fig. 5). The head is large, convex in front, concave or flattened behind, in the male almost wholly composed of the eyes, which meet together above in that sex, but are separated in the female. In life the eyes usually exhibit golden green or purple markings. The antennæ project conspicuously in front of the head, as does also the proboscis in many species of *Pangonia* (fig. 6), in which genus the latter organ is sometimes enormously elongated. In other genera the proboscis is short, and protrudes vertically beneath the head, with the piercing mouth-parts enclosed in a fleshy lower lip. In colouration the majority of Tabanidæ are somewhat sombre, some shade of brown or black being the most frequent hue, the abdomen, however, often being lighter or exhibiting lighter markings. The wings, which when at rest, diverge at the tips or are somewhat tectiform, are in many species conspicuously banded or blotched; those of the species *Hæmatopota* are characteriscically mottled.

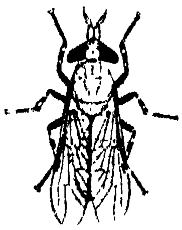

FIG. 7.—*Hæmatopota*, *sp.*, from Zululand, in resting attitude, showing the position of the wings (× 2). The wing markings are omitted.

Life-history.—The spindle-shaped brown or black eggs are deposited closely packed in sub-conical or flattened masses, which are attached to the leaves and stems of plants. The larvæ are whitish soft-bodied grubs, and are found in water, in wet sand or mud, in earth, or in decaying vegetable matter. In shape they are cylindrical, tapering at each end, with a small retractile head, and often encircled with rings of retractile fleshy protuberances, which, however, may be confined to the ventral side. These larvæ are carnivorous, preying upon beetle larvæ, snails, worms, etc. The pupa, which is not unlike that of a Lepidopterous insect, remains stationary in the earth or water, or in damp rubbish at the edge of the latter.

Habits of the perfect insects.—The males haunt flowers or herbage, but occasionally hover in the air. The blood-sucking females are persistent tormentors of human beings and domestic animals; horses, cattle, and elephants often streaming with blood in consequence of their attacks. In "The Nile Tributaries of Abyssinia"* the late Sir Samuel Baker speaks of herds of game between the Setit and Atbara Rivers retreating before the attacks of Serut-flies. The species of *Hæmatopota* and *Chrysops*, and the smaller species of *Tabanus* are remarkable for the quietness with which they alight on their victims, the sharp prick of the bite being often the first intimation of the presence of the fly. The larger species of *Tabanus* betray their approach by their loud hum.

Leptidæ (no English names known).

The Leptidæ are a small but widely distributed family of slenderly built flies of moderate size. Their inclusion among blood-sucking forms is due to individuals of four different species having been observed in a small number of instances to suck human blood; but since the Leptidæ normally prey upon other insects the blood-sucking habit is certainly exceptional and perhaps to be ascribed to individual aberration. The species in the case of which the habit has been recorded are an undescribed *Symphoromyia*, the female of which, according to Baron Osten Sacken, who observed it near Webber Lake, California, in the month of July, bites quite painfully "and draws blood like a *Tabanus*"; the common European *Leptis scolopacea*, Linn. (of which both sexes have been stated to bite) and *L. strigosa*, Mg.; and *Trichopalpus obscurus* Phil., a species with an elongated proboscis, common in the Province of Valdivia, Chile, in December and January, and said to be a greedy blood-sucker. The observations with regard to the two species of *Leptis* were made in France.

Appearance.—Narrow-bodied flies, from 6 mm. to 13 mm. in length, with long legs and with the abdomen usually tapering towards the tip. The eye meet together in the males above the small antennæ, but are separate in the females. The proboscis is usually short and fleshy, occasionally elongated, the venation of the wings resembles that of the Tabanidæ. As a rule some shade of brown or yellowish brown forms the prevailing colour, and the wings are frequently blotched with brown. When at rest the wings are carried flat or nearly so, diverging widely at the tips.

Life-history.—The oviposition of the alleged blood-sucking species has not been observed. According to Beling, the larvæ of *Leptis*, which are shining white or yellowish in colour, with a small brown head, and four papillæ arranged in the form of a square on the anal segment, subsist chiefly upon earthy and decaying vegetable matter, and are found for the most part in woods, beneath the carpet of leaves or pine needles, as well as in decaying tree-stumps, etc. The same author states that the larvæ of *Leptis* may be distinguished at the first glance from other similar larvæ, such as those of *Hæmatopota* by certain characteristic markings on the upper side of the first two body segments, by the structure of the anal segment, and specially by their great mobility. The larva of *Symphoromyia crassicornis*, Pz., a European species, was found by Beling under turf at the edge of a beech-wood. It is described as measuring 12 mm. in length, dirty white in colour, tapering somewhat towards both extremities, with a small brown head.

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* London: Macmillan & Co., 1867, p. 210.

Habits of the perfect insects.—The flies of the sub-family *Leptinæ*, which includes the genera *Leptis* and *Symphoromyia*, are somewhat sluggish, and are fond of resting motionless and head downwards upon the trunks of trees in shady places. Their flight is short and noiseless.

Muscidæ (*Tsetse-flies*, and their allies).

In this family the blood-sucking habit is highly exceptional, and is confined to a very few genera and species, all of which in appearance present a general resemblance to the Common House-fly. In cases in which the blood-sucking habit occurs, it appears to be common to both sexes. The following are the blood-sucking genera of Muscidæ hitherto described: *Stomoxys* (with about a dozen species; this genus is universally distributed, and it is possible that several additional species have yet to be described); *Lyperosia* (with two species, one of which occurs in Europe and North America, the other in Somaliland; three additional species, probably distinct and as yet undescribed, are found in West Africa, Sokotra, and Ceylon); *Glossinella* (with one species found in German East Africa); *Hæmatobia* (with three species, two European, the third found in Java); *Beccarimyia* (with a single species, described from the neighbourhood of Massowah); and *Glossina*, or Tsetse-flies (eight species, restricted to Africa and Southern Arabia). In addition to the foregoing, representatives of two species for which a new genus will probably have to be created have recently been obtained in West Africa and India.

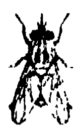

FIG. 8.
Stomoxys sp., from Natal in resting attitude, showing the position of the wings, (× 1½).

N.B.—In view of the near relationship between *Stomoxys* and *Glossina* (Tsetse-flies), it is desirable that special attention should be paid to the former in order to discover whether the species of this genus are capable of conveying any species of *Trypanosoma*.*

Appearance.—As stated above, the blood-sucking Muscidæ all present a general resemblance to the Common House-fly, which, however, in the case of Tsetse is obscured by the fact that the wings in the resting position (fig. 10), instead of diverging at an angle, are closed one over the other like the blades of a pair of scissors. With the exception of the largest species of *Glossina*, these flies are all of small or moderate size; and even the largest Tsetse-flies do not exceed 12 mm. (about half an inch) in length, exclusive of proboscis and closed wings. The length of an average specimen of *Lyperosia* is from 3 to 4 mm., that of a similar specimen of *Stomoxys* about 6½ mm. The coloration of the flies of this group is some shade of grey, brown, or yellowish brown, sometimes with darker markings; in certain of the species of Tsetse-flies, although not in all, the abdomen is conspicuously banded. The wings of blood-sucking Muscidæ are uniformly hyaline or brownish, never blotched or mottled. The sexes are usually very similar, but can generally be distinguished by the eyes being closer together in the males. Lastly, it is to be noted that in all forms there is a hard chitinous proboscis, ensheathed in the palpi in the case of Tsetse-flies, which in its normal position, when not in use, projects horizontally beneath and in front of the head.

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* A species of *Stomoxys* [*S. nigra*, Macq.], abundant in Mauritius during the hot season, has recently been announced to be the "almost certain" disseminator of Surra in that island. See Lieut.-Col. Mander's "Journal of the Royal Army Medical Corps," Nov. 1905, pp. 623—6.

Life-history.—With the exception of *Glossina* the species of this group breed, as a rule, in dung, depositing eggs from which are developed white maggots of the type of those of the Common European Blow-fly. According to Riley and Howard, *Lyperosia irritans*, L. (*Hæmatobia serrata*, Rob.-Desv.) oviposits on fresh cowdung, and its eggs are irregularly oval in shape, flattened on one side, and from 1·25 to ·137 mm. in length, 0·34 to 0·41 mm. in width. The newly hatched larvæ descend into the dung, and eventually when full-grown attain a length of 7 mm. Pupation takes place in the ground beneath, at a depth of from half to three-quarters of an inch. The puparium is of the normal Muscid type, dark brown in colour, barrel-shaped, and from 4 to 4·5 mm. in length, by 2 to 2·5 mm. in width. *Stomoxys calcitrans*, L., a species that is abundant throughout Europe and North America, usually breeds in horse-droppings, and its larvæ are very similar to those of the Common House-fly, which also breeds in horse-dung. The life history of Tsetse-flies is of an abnormal type, the female producing a single larva at a time, which is retained and nourished within the oviduct of the mother until full-grown, and on being extruded at once crawls away and buries itself in the earth, where it turns into a pupa so soon as it finds a suitable hiding place. The pupa is dark brown, with a pair of prominent granular protuberance at the posterior extremity.

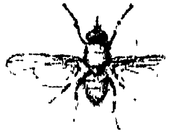

FIG. 9.—*Lyperosia* sp. ♀ Sokotra (× 3).

Habits of the perfect insects.—Some of the species of this group, especially those of *Stomoxys* and *Glossina*, attack man as well as domestic animals, and it is possible that in the case of *Glossina palpalis*, in certain parts of Africa, at any rate, such as Uganda, human blood forms the chief food; other species of Tsetse-flies appear to subsist normally on the blood of big game.* The species of *Lyperosia* attack horses, cattle, and camels. In the United States *Lyperosia irritans* (*Hæmatobia serrata*) is known as the "Horn-fly" from its habit of clustering in masses about the base and on the concave side of the horns of cattle. According to Riley and Howard, it reduces the condition of stock to a considerable extent, but statements as to the death of animals from its attacks are unsubstantiated. When feeding, the fly is found on the back, flanks, legs, and under the thighs. In Europe and North America *Stomoxys calcitrans* is often found in houses.

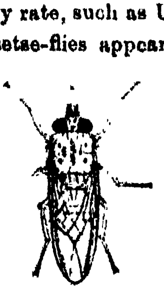

FIG. 10.—*Glossina longipennis*, Corti, from Somaliland, in resting attitude, showing the position of the wings (× 1½).

A Blood-sucking Larva.—The so-called "Congo Floor-

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* For further information on the habits, etc., of Tsetse-flies, see "A Monograph of the Tsetse-flies," by E. E. Austen (London, 1903: published by the Trustees of the British Museum).

Maggot" is the larva of *Auchmeromyia luteola*, Fabr., an African Muscid fly, which is found from Nigeria to Natal, and is itself incapable of sucking blood. The maggot, which attains a length of 15 mm., lives in the floor of native huts, and at night fastens upon the limbs of sleepers and sucks its fill of blood. The perfect insect is about 11 mm. in length, and pale yellow in colour, with the distal portion of the abdomen, except the tip, bluish black.

Hippoboscidæ.

This family, which is distributed throughout the world, includes a number of small genera, the species of which are all parasitic on mammals and birds. From the point of view of possible dissemination of disease, however, it is unnecessary to consider here the bird-parasites belonging to the genera *Olfersia*, *Ornithomyia*, etc.* The mammal-parasites are comprised in the genera *Hippobosca*, *Allobosca*, *Ortholfersia*, *Lipoptena*, and *Melophagus*. The genus *Hippobosca* is probably represented throughout the world, and, with one exception,† its eight or nine species are parasitic on horses, donkeys, camels, cattle, or dogs. It is probable that certain species have been introduced with horses into new localities. At Pretoria Dr. Theiler has succeeded experimentally in inoculating cattle with *Trypanosoma theileri* by means of *Hippobosca rufipes*, v. Olfers (fig. 11). *Allobosca*, comprising the single species *A. crassipes*, Speiser, has only rudimentary wings, and is parasitic upon lemurs in Madagascar. *Ortholfersia*, of which two species have been described, is found on kangaroos and wallabies in Australia, Tasmania, and New Zealand. The seven or eight known species of *Lipoptena* are deer- and goat-parasites occurring in Europe, North, Central, and South America, Japan, Malacca, Ceylon, Sinai, the Anglo-Egyptian Sudan, and South Africa. Recently the European *Lipoptena cervi*, L., has been met with in the Transvaal, and it is possible that it was accidentally introduced with remounts during the Boer War. The single species of *Melophagus* (*M. ovinus*, L.) is a parasite of sheep in Europe and North America.

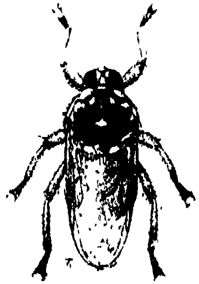

FIG. 11. — *Hippobosca rufipes*, v. Olfers S. Africa (× 2).

Appearance.—Broad, flat-bodied, horny flies, with long wings, except in the case of *Allobosca*, and of *Melophagus*, which is entirely apterous, and very dissimilar in appearance to an ordinary fly; in the other forms the wings in the resting position lie flat over the body closed one over the other like the blades of a pair of scissors (fig. 11). The female *Lipoptena* almost invariably sheds her wings on reaching a suitable host, and the male frequently does the same.

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* Similarly, the bat-parasites belong to the families Nycteribidæ and Streblidæ, which with the Braulidæ (bee-parasites) and the Hippoboscidæ make up the group of Diptera known as the Pupipara, may also be disregarded. It should be noted, however, that under exceptional circumstances human beings may be attacked by parasitic blood-sucking insects which are normally found on quite other hosts.

† *Hippobosca struthionis*, Janson, which is said to be found on ostriches in Cape Colony.

In length these insects range from about 3 mm. in the case of a small *Lipoptena* to 12 mm. or nearly half an inch in that of a female *Hippobosca camelina*. The general coloration is a reddish or yellowish-brown, with the thorax mottled with yellow in the case of *Hippobosca*. The legs in all species are powerfully developed, and the claws have a secondary process on the underside to assist the insect in clinging to the hair of the host. The eyes are widely separated in both sexes, and the proboscis consists of a pair of downwardly projecting lobes, between which a slender inner tube can be protruded from the head.

Life-history.—The mode of reproduction of these flies may be described as a further development of the process seen in the Tsetse-flies. In the case of the genera now under consideration, the larva is retained within the oviduct of the mother, as in *Glossina*, but on extrusion it is incapable of movement, shows little or no trace of segmentation, and its integument simply becomes chitinised and darkened to form the pupal envelope. The larva of *Hippobosca* on extrusion is a white ovoid or globular body, with a black cap at one pole, which speedily becomes almost obliterated by the general chitinisation of the integument.

Habits of the perfect insects.—The winged members of this group as a rule fly but little, and only for the purpose of moving from one host to another, or from one part of the body of a host to another on being disturbed. When using its legs, *Hippobosca* often runs sideways like a crab. The flies of this genus, which infest horses and cattle, live chiefly between the thighs, along the perinæum, and under the tail. In India *Hippobosca francilloni*, Leach (*H. canina*, Rond.), which infests dogs, has been found to the number of fifty or a hundred on the necks and chests of pariahs.

PART II.

Directions for the Collection of Specimens.

LIST OF ARTICLES REQUIRED.

An entomologist's collecting-net.—This can be obtained from any dealer in natural-history apparatus. Any net used for collecting butterflies will do for Diptera; but, on the whole, perhaps an ordinary umbrella-net will be found the most serviceable. One or two spare net-bags should be taken in case the one in use gets torn.

Two dozen glass-bottomed *cardboard pill-boxes* (assorted sizes, up to 2¼ inches in diameter, packed in nests one inside another).[*]

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[*] These boxes can be obtained from Messrs. Watkins & Doncaster, 36, Strand, London, W.C.; but care should be taken to see that the *bottoms*—and not the tops, as is often the case—are made of glass. Since the boxes are constructed of cardboard, they are liable in tropical countries to go to pieces in the rains; and to prevent this they should be covered with jaconet in the following manner, the important point to remember being that the jaconet must be cut in strips *on the cross*:—Obtain, say, a square yard of the material, and fold it into a triangle by bringing two opposite corners together. Consider how wide the strips must be, according to the varying depths of the boxes to be covered, and rule them off in pencil by drawing lines *parallel to the base* of the triangle. Cut up the strips, or if possi-

One or two *cyanide killing-bottles*, not too large to be carried in the pocket when required; or a larger-sized cyanide killing-jar, or materials for making same, as follows: ¼ lb. of cyanide of potassium,* 1 lb. of plaster of Paris, a glass jar with wide mouth and closely fitting lid.†

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ble get them cut by a book-binder's machine. Paint the box over with liquid glue, and wrap the jaconet round it: it is particularly important that the edges of the glass and lid should be well protected; and it will be found that by gently pulling the jaconet it will wrap itself round these without difficulty. When quite dry, say the following day the box should be given a coat of Aspinall's enamel, or of paint, a second (and if necessary a third) coat of paint being added after the first is dry. Any paint or glue on the glass can be removed with a penknife; if the jaconet protrudes too far over the glass, cut it round with a penknife and remove it. (Glass-bottomed boxes already protected in this manner can be obtained from Miss E. M. Bowdler Sharpe, 4, Barrowgate Road, Chiswick, London, W.)

A simpler method of protecting the boxes is to coat them (especially the joints) with shellac dissolved in absolute alcohol.

Glass bottomed boxes of this kind constructed of tin are sometimes sold; but these are not to be recommended, since when in use in warm climates they are apt to become very hot, with the result that flies contained in them are killed and become dry prematurely.

* If it is intended to take cyanide to a damp tropical climate, it should be conveyed in the form of *lumps*, in a bottle with a tightly fitting glass stopper. Cyanide of potassium is also sold in rods, and, in this form, might be conveniently carried in short lengths in hermetically sealed tubes of thin glass, of diameter and length just sufficient to take the section of cyanide rod.

† Cyanide killing-bottles can be procured ready for use from Hinton & Co., Bedford Street, London, W C, or any other chemist will prepare one to order; but when Diptera are collected in the manner advised below, it is preferable to use a large-sized killing-jar, which should be made as follows:—Take any fairly large glass jar (such as a pickle-bottle) with a wide mouth and closely fitting lid (a lever-lid such as those often fitted to pickle-bottles would answer admirably), and cover the bottom with a layer of dry plaster of Paris to the depth of ½ inch; pour in above this a layer equal in depth consisting of *powdered* cyanide of potassium, mixed with rather more than its bulk of dry plaster of Paris; cover this mixture with a layer of dry plaster of Paris to the depth of ¼ inch or so; and pour in above the whole a layer ½ inch in depth, consisting of plaster of Paris mixed with water to the consistency of cream. As soon as the top layer of plaster is dry the jar is ready for use: the plaster, however, should be covered with several thicknesses of blotting-paper, to avoid risk of injury to specimens in case the surface should at any time become wet. To obviate the danger of cracking the jar owing to the heat evolved when plaster of Paris is mixed with water, it may be advisable to stand the jar in warm water before adding the final layer. The exact amount of cyanide of potassium to be used is of no great consequence; but in the case of a properly prepared jar the odour should be readily perceptible on removing the lid; if it is not, the reason may be that the mixture is too dry, when a little water poured on to the top layer will probably set matters right. After some months' use the cyanide loses its efficacy (to obviate this so far as possible the jar should never be allowed to remain open), and the mixture must then be renewed.

A rough-and-ready method of making a killing-jar or bottle is to cover the bottom with a layer of powdered cyanide, and to place above this a number of layers of blotting-paper. The layers of blotting paper immediately in contact with the cyanide must be slightly damped; but only sufficient water should be used to cause the cyanide to give off its odour. The top layer of blotting-paper must on no account be wet, and the less water used the better.

Entomological forceps (two pairs), with curved ends for holding pins (from G. Buck, 242, Tottenham Court Road, London, W.).

FIG. 12.
Entomological
Forceps.

Fine-pointed forceps (one or two pairs): these are useful for arranging the legs and wings of specimens when pinned; they can be obtained with the above.

Needles (two or three) *mounted in handles*,—also for arranging legs and wings.

Entomological pins (D F. Tayler & Co., New Hall Works, Birmingham) Nos. 5 (1*s*. 6*d*. per ounce), 7 (2*s*. 6*d*. per ounce) and 20 (7*s*. 6*d*. per ounce). The No. 20 pin should be used for all but the very largest Diptera, such as Horse-flies (Tabanidæ); as it is exceedingly fine, an ounce will go a very long way.

Common pins—a thousand or two, in paper packets.

Gun-wad punches, Nos. 4, 12, and 20 bores (from any gun-makers), for punching discs of card.

Cards (3 sheet Bristol board), from which to punch discs; a supply of the latter should be prepared ready for use.

A platyscopic lens (Messrs. Baker, 244, High Holborn. London, W. C.; or John Browning, 63, Strand, London, W. C.: price about 15*s*). The magnifying-power should not be too high—from 10 to 15 diameters is about the best.

Cork-carpet or pith.—Two or three sheets about 6 inches square, on which to perform the operations of pinning, etc. (Cork-carpet can be obtained at Harrod's Stores, Brompton Road, London, S. W.)

Two or three cork-lined entomological store-boxes.—These can be obtained from Messrs. Watkins & Doncaster, or any other dealer in natural history apparatus. For a collecting trip or expedition of some duration the boxes should not be smaller than about 18 inches by 12, and they must be sufficiently deep to prevent the heads of the pins from coming into contact when both sides of the box are filled. Should the collector run out of store-boxes, *cigar-boxes* in the bottom of which is fixed a layer of cork-carpet or pith, make efficient substitutes; but if pith is used, it should not be less than ¼ inch thick.

Alcohol, 90 per cent. (ordinary rectified spirit).

Perchloride of mercury, aqueous solution, 1 in 500.

METHOD OF COLLECTING.

If possible, Diptera should always be brought home alive in the glass-bottomed pill-boxes (to which they are to be transferred on being captured in the net), and should then be killed in the cyanide-bottle or jar immediately before being pinned. As soon as a fly is taken in the net by a dexterous sweep, a sharp turn of the wrist must be given (following a smart downward or lateral stroke in order to bring the fly to the end of the net), in such a way that the end of the net containing the insect falls over the rim and so makes a closed bag from which it cannot escape. The end of the net can then be gathered up in the hand, and the fly forced into a still smaller space, in which it will not be difficult to get it into a pill box, and then to slip on the lid. If the specimens are small, it is possible with care to get several into one pill-box. Flies may also be transferred direct from the net to the killing-bottle, and so brought home dead; but this method is not to be recommended, since prolonged exposure to the effects of cyanide of potassium is apt to injure the specimens; the ultimate condition of which, when so treated, is rarely as satisfactory as if they had been brought home alive in pill-boxes. If, however, it is necessary for any reason to dispense with pill-boxes, and to use the killing bottle in the open, a little crumpled tissue-paper should be placed inside it; this affords a lodgement for the specimens, and so lessens the risk of their being injured by rolling about. It is always advisable when out collecting to carry a killing-bottle for use in case of need, in the event of the supply of pill-boxes running short. Diptera on windows may be captured in pill-boxes; if the edge of the box is slightly raised from the glass on one side, and a little tobacco smoke blown into it so as temporarily to stupefy the fly, it will be found easy to slip on the lid without allowing the insect to escape.

KILLING.

Diptera brought back alive after a day's collecting should be killed by being placed for a few minutes in the closed cyanide-bottle or jar. If the cyanide-jar is sufficiently large, the pill-boxes themselves may be placed therein, first opening them a fraction of an inch on one side to allow the cyanide to take effect. In the case of large sluggish Diptera, such as *Tabanus*, the pill-box may be opened without fear of the insect effecting its escape; after which a smart tap on the bottom of the box will cause the fly to drop into the jar. Diptera should never be allowed to remain exposed to the effects of the cyanide longer than is necessary to ensure their being quite dead. If the poison is of reasonable strength, four or five minutes should be sufficient to kill even the largest and strongest flies; on the other hand, it is necessary to make sure that the insects are really dead, since, if the exposure to cyanide has been too short, flies will often appear to be dead when in reality they are only stupefied. As soon as the insects are really dead, they should be removed from the killing-jar; those in pill-boxes may be allowed to remain therein until one is ready to pin them, while the loose specimens should be turned out on to a sheet of cork-carpet or pith.

METHODS OF PRESERVING DIPTERA OTHER THAN BY PINNING.

Diptera should aways be pinned, and this should be done as soon as they are dead. If preserved in any other way, they will never make such satisfactory specimens.

When, however, it is impossible to pin them, Diptera may be preserved in fine sawdust, on which a few drops of dilute carbolic acid should be sprinkled to prevent mould. Each specimen, before being placed in the sawdust, should be loosely screwed up in fine tissue-paper (cigarette-paper would do), on which the necessary data (see below under "Pinning") should be written in pencil. To contain the specimens a small tin box (such as those in which tobacco is sold) should be used ; and to prevent injury from shaking, the box should be packed *quite full* of sawdust and specimens.

Diptera may also be put away for transport in three-cornered envelopes of soft paper (newspaper), after the manner in which butterflies are packed by collectors ; but this method does not suit thick-bodied flies, such as *Tabanidæ*, as these are often crushed by it, and if once flattened cannot be restored to their natural shape. Envelopes containing Diptera or other insects may be conveniently packed in tin tobacco or biscuit-boxes for transmission by parcel-post from abroad. A few drops of weak carbolic acid should be sprinkled over each layer of envelopes, and the box should be packed quite full.

It is never advisable to put Diptera for transmission from abroad into small boxes containing wool, as when flies are once in contact with wool, and have become dry, it is very difficult to remove them without pulling off legs, bristles, etc.

PINNING.

Take a card disc, and write *legibly* on it all the data connected with the specimen to be pinned, as follows : (1) name of *locality*,* including altitude if necessary ; (2) *date*—day, month, year—thus, 20. 11. 06 ; (3) *collector's name* ; (4) any *brief remarks of interest* (which may if necessary be written on the other side)—*e.g.* "Very common" ; "Only specimen seen" ; "On porter's back" ; "At watering-place in stream" ; "Running on banana leaves." Longer notes on habits, etc., should be entered in a note-book, with a number corresponding to one written on the disc. Specimens taken *in coitû*, for which a good look-out should always be kept when collecting, should have the fact noted on the disc of each, thus : "A—*in coitû* with B" ; "B—*in coitû* with A."

Place the disc on which the above particulars have been written, plain side uppermost, on a sheet of cork carpet or pith, and, picking up with the forceps an entomological pin (a No. 20 if the specimen is not larger than a Blue-bottle, otherwise a No. 7 or No. 5), thrust it through the centre of the thorax of the specimen, until about ⅛ inch protrudes beneath. Next grasp the pin with the forceps near the tip, and thrust it through the disc, drawing it well down. Lastly, thrust an ordinary pin through the disc near the margin for the purpose of carrying both disc and specimen, and draw the disc a good half-way up the carrying-pin.

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* Should this be not likely to be found in an ordinary atlas, the name of the nearest well known town, or river, bay, mountain, etc., or the approximate geographical position should be added.

The last thing to be done is to arrange the legs and wings as far as possible. The wings must be made to project at an angle from the body, and not allowed to lie closed over it; if they can be got to remain at right angles to the body, so much the better. In the case of any specimen that is not too small and fragile, the wings can be best arranged by means of the fine pointed forceps, by making a gentle simultaneous pressure with tips of the forceps at the base of each wing, repeating it until the wings assume the desired position. The legs also must be disposed symmetrically (and as far as possible in a natural position) on the card disc, so that all parts of them can be readily seen, and must not be allowed to remain crumpled up beneath the body, since important characters are often found upon them. In the case of a fairly large specimen it will generally be found possible to cause legs to remain in the desired position by hooking the claws on the edge of the disc, gently drawing the legs out one after another by aid of a needle or one leg of the fine-pointed forceps. The manipulations in connection with the legs and wings must be performed as gently as possible, and care must be taken that bristles, hairs, or scales are not rubbed off in the process. As soon as these operations are completed, the specimen should be transferred to a store box, or to one lined with cork-carpet or pith, as described above. Since, however, the tissues contract in dying, the legs and wings are very apt to get pulled out of place, and, to correct these changes, the specimens should be examined once or twice during the next day or two after being pinned.

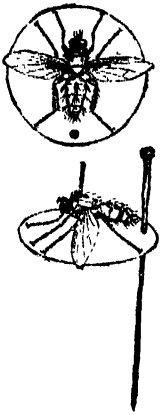

FIG. 13.—Use of Discs.

Very minute or fragile specimens (such as *Ceratopogon* or *Simulium*) are best *pinned from the side*, and the legs should then be straightened out by means of a No. 20 pin held in the entomological forceps.

DIPTERA COLLECTED IN THE TROPICS:

ATTACKS BY ANTS—MOULD—TRANSMISSION TO ENGLAND.

In the tropics boxes of pinned insects are very liable to be attacked by minute *ants*, which, if they once gain access to a box unobserved, will soon play havoc with its contents. In Brazil it has been found that ants can be prevented from entering insect-boxes by smearing the outside round the line where the box opens, or any other possible place of entrance, with *andiroba* oil, repeating the process as often as necessary; similar methods might be employed else where in case of need.

Mould, however, is an even greater enemy to collections of Diptera. Pinned specimens of Diptera, like those of other insects, rapidly develop mould during the rainy season in tropical countries; and since mouldy specimens are practically worthless for purposes of scientific determination, *Diptera should always be sent home as soon as possible after being collected.* The risk of mould may however, be diminished by pinning in a corner of the box a small piece of sponge saturated with the strongest carbolic acid, which should be constantly renewed. The greatest care must be taken to prevent specimens getting loose and rolling about in transit, since in this way a single loose disc might easily do irreparable injury to many other specimens in the box. To prevent this the pins supporting the discs should be inserted as tightly as possible into the cork-carpet or pith, and they should all be driven in to the same level, after which a sheet of soft paper (newspaper does very well) can be *fixed* into the box, resting on the heads of the supporting pins, in order to minimise the damage should a disc happen to get loose. The box containing the specimens should be well wrapped in cotton-wool or similar material, to secure it from shocks on the journey, and firmly *packed in an outer case* for transmission (by parcel-post if possible and if the package is not too large) to England.

NUMBER OF SPECIMENS OF EACH SPECIES REQUIRED.

At least half a dozen specimens of *each sex* of a species should, if possible, always be obtained, and a good look-out should be kept for specimens showing any abnormality in structure, coloration, or size. When the collector remains long enough in one spot, he should always endeavour to obtain specimens of a species on different dates, in such a way as to throw as much light as possible on the duration of its seasonal occurrence. Similarly the attempt should be made to illustrate the geographical range or local distribution of a species, by collecting specimens in as many different localities as possible. Specimens of species taken in new localities, though common elsewhere, will always be valuable.

IN ADDITION TO PINNED SPECIMENS, OTHERS SHOULD BE PRESERVED IN ALCOHOL.

Pinned specimens should always, if possible, be accompanied by others preserved in alcohol. The following directions have kindly been supplied by Lieut.-Colonel G. M. Giles, who has found that the method indicated answers well in practice :—" Flies intended for anatomical examination must be fixed by heat, since their chitinous envelope is penetrated so slowly by alcohol that, f this be not done, they decompose before the preservative can reach them. It is sufficient to bring them to boiling temperature in a test-tube of water, but for delicate histological work it is better to boil in a mixture of equal parts of 90 per cent. alcohol (ordinary rectified spirit) and aqueous solution of perchloride of mercury, 1 in 500. Even protozoal parasites are well preserved by this method. When fixed, preserve in 90 per cent. alcohol. *Methylated spirit* should *not* be used, since its acidity and other impurities may lead to embarrassment in the use of aniline stains." The specimens should be preserved in small glass tubes, with a plug of soft paper placed inside on the top of the specimens to prevent them from being injured by washing about in transit. A slip of paper, on which all necessary data should be written clearly *in pencil*, should be placed *inside* each tube, and the pinned specimens of the same species should be labelled with a reference to those in spirit, so that the latter may be identified. The tubes containing the specimens should preferably be placed for transmission inside a larger bottle of spirit; if this be done, it is only necessary to secure the mouth of each tube by tying muslin over it. Cotton-wool, or, better still, horse-hair or shavings, should be inserted as packing between and especially on the top of the tubes.

LARVÆ.

Specimens of larvæ will always be valuable whenever it is possible to breed out some of them so as to determine the fly to which they belong. Unless, however, the perfect insect is known, it is rarely possible to do more than to determine the *family* or *genus* to which a larva belongs. Larvæ for preservation should be killed by immersion for *a moment or two* in boiling water, and should then be placed in weak spirit (two-thirds spirit and one-third water); after being allowed to remain in this for two or three weeks until thoroughly hardened, they can be transferred to stronger spirits. The larvæ of each species must of course be kept separate, and should be put up in a small corked glass tube full of spirit, the necessary particulars, with, if possible, a reference to pinned specimens of the perfect insect, being written in pencil on a scrap of paper and placed *inside*. The tubes should be packed for transmission inside a larger bottle of spirit, as described at the end of the previous paragraph.

NOTES ON HABITS, ETC.

Comparatively little is yet known as to the bionomics of blood-sucking Diptera in general, so that notes on the habits, distribution, seasonal occurrence, relative frequency, etc., of particular species will always be of great value and interest. Clinical observations as to the effect of the bites of the various species on man and domestic animals are also required.

PART III.

Fleas, Bugs, and Ticks.

FLEAS, bugs, and ticks are wanted in addition to Blood-sucking Diptera. These creatures, however, must not be pinned, but should be preserved and sent home in alcohol, by the same method as that recommended for Diptera (see page 179). To contain the specimens it is best to use small corked glass tubes, which should be carefully packed in cotton-wool in a strong wooden or metal box for transmission to England. A plug of soft paper should be placed on the top of the specimens in each tube, to prevent injury from shaking or washing about, and there should also be inserted in the tube a slip of paper bearing the necessary data written in pencil. Specimens of different species should of course be put up in separate tubes.

BRITISH MUSEUM (NATURAL HISTORY),
CROMWELL ROAD,
January 16th, 1907. LONDON, S. W.

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REVIEW—"INDIAN INSECT PESTS."

The publication of "Indian Insect Pests" by H. Maxwell-Lefroy, M.A., F.E.S., F.Z.S., Imperial Entomologist, marks a new stage in the advance of Indian Entomology. That those orders of insects which are beautiful or curious should have been investigated before those which are useful or harmful was natural and reflects no discredit on entomologists, for, though it has been abundantly proved in our time that a knowledge of science is of the highest utility, considerations of utility are not the highest motive of science. Since the practical value of an intimate knowledge of all forms of life has begun to be generally recognised, the benevolent contempt with which the enthusiast with the butterfly net used formerly to be regarded has given place to a more respectful feeling ; but the said enthusiast deserves the more honour that he was actuated by no motive except what the author of this book happily describes as "that intense organised curiosity which lies at the root of modern science." That this curiosity should be linked with admiration for the beautiful is natural and right, and that it should commence with what is most obvious and accessible was inevitable. So butterflies were attacked first, and it is now nearly fifty years since Captain Marshall started the magnificent work, which, though never completed, has stimulated the study of Indian butterflies to a degree that cannot be estimated. Fifteen years passed before the same thing was attempted on behalf of moths, and the Hymenoptera followed quite recently. Coleoptera, Diptera and Orthoptera, the Orders to which our worst insect pests belong, with Hemiptera and Neuroptera, must still be studied under difficulties which are practically insurmountable to the district officer. But for a long time the Indian Museum at Calcutta has been doing work which amateurs had not the means of doing, and has directed its attention especially to economic entomology. From time to time fragments of the knowledge acquired were given to the public in the form of Indian Museum Notes, very useful of their kind, but easily lost and soon forgotten. The appointment of a Government entomologist gives continuity to this work, and the present incumbent has been well advised to gather up and publish, in a handy form, the practical results of the work done up to date by himself and other investigators. The amount of it will surprise those who have not been in touch with the workers in this field. About a hundred species of injurious insects are here described and in most cases the life history of the pest is described *ab ovo*, so that the agriculturist may know the tactics of the enemy with which he has to deal : valuable suggestions are often made as to the best means of combatting it. A number of insects are included which, as a matter of sentiment, we would rather had been omitted, as for example, the caterpillar of the swallow-tailed (without tails) butterfly, commonly known as *Papilio erithonius*, which the author calls *P. demolius*. The occasions on which it amounts to a pest must be very rare indeed and the man who does not then adopt the simple and sufficient remedy of picking off the conspicuous caterpillars deserves to suffer loss. Ordinarily, with respect to pests of this sort, the beauty of which amply compensates for any little harm that they do, we would rather endeavour to give currency to the sentiment of Robert Burns :—

I'll get a blessing wi' the lave
And never miss't.

A number of other insects are described which are the natural enemies of the pests and wholesome counsel is offered with respect to the encouragement of these and other friends of the farmer, especially birds.

It is evident that, however simply a subject of this nature may be presented, it must, to a certain extent, be unintelligible to a man void of all knowledge of the structure and life of an insect. Therefore the first chapter of the book is devoted to imparting a small measure of this necessary knowledge. This part of the work appears to us to be admirably done. It is soundly scientific without technicality and the abundant and excellent illustrations help to make it very lucid. It is refreshing to find the distinction clearly and emphatically laid down between those insects which have a metamorphosis and those which have none ; for this has been much obscured by the too common practice of applying the word larva to the young of grasshoppers, cockroaches, &c. A young cockroach is not a larva, nor is a calf, nor a baby. These retain the same form through life, with the exception of certain outward accompaniments of adolescence, such as wings, horns, or a beard. The marvellous phenomenon of metamorphosis is made more wonderful by the fact of its being confined to certain orders of insects, and every teacher of entomology ought to make this truth stand out like a lighthouse, else he is not fit to teach. The distinction has a practical importance too, which the author of "Indian Insect Pests" has apprehended.

The book ends with formulæ for insecticides and other miscellaneous information, a copious index and a list of plants. Everything has been done to make it complete within its limits and the illustrations are superabundant and of high quality. Finally, the book is a marvel of cheapness. In short it is eminently fitted for usefulness. But who will use it? The ordinary "ryot" from the Himalayas to Cape Comorin stands in deep need of the lessons which it contains, for his ignorance of simple matters affecting his well-being is, in this direction, incredible. He is not by any means so much in need of instruction in his own business as many of those who feel called upon to put him right are apt to imagine. But with respect to animal life he is strangely ignorant. He has been plagued by mosquitoes for a hundred generations without discovering that mosquitoes come out of water. Nor will he believe it when told. Mosquitoes are birds ; the little wriggling creatures which you point out to him in the water are fishes : how can one turn into the other? But his mind is naturally open to the miraculous, and if ocular demonstration of the transformation of the swimming larva into the flying mosquito is presented to him, his conversion will be immediate and thorough. He will be ready for practical applications of his new and wonderful knowledge. But this book is written in English and he cannot read his own language, so it is impossible for him to derive any benefit from it directly. On the other hand the class who should lead and show him the way is wanting. It is a lamentable fact that practical agriculture has little attraction for the very class of people who compass heaven and earth to obtain land. There are bright exceptions, educated zamindars or landholders who endeavour to apply their education to the improvement of the means by which the great bulk of their countrymen earn their bread. But these are very few. In one direction we see hope. The agricultural schools which are being established all over the country and the experimental farms are gradually creating a class of men whose vocation is agriculture and whose minds have been imbued with some Western ideas about it. Through these we may confidently hope that the new knowledge may gradually be disseminated among the peasantry. And it is not impossible that "Indian Insect Pests" may form the basis of a simple vernacular literature on the same subject. In the meantime it will be welcomed as a much needed aid by many of those officers of an alien race whose duty it is to exact from the poor stupid peasant what he owes to their Government, but whose sympathetic efforts go out in so many directions for the betterment of his lot.

THE LATE MR. L. C. H. YOUNG.

It is with great regret that we have to announce the death of Mr. Lawrence C. H. Young, B.A., F.Z.S., F.E.S., which took place at Henley on Thames on the 8th September, 1907, at the age of 30. Mr. Young was educated at Marlborough College, where he had the advantage of studying under the well known entomologist Mr. E. Meyrick, and first developed an interest in Entomology. From Marlborough he proceeded to Exeter College, Oxford, where he took honours in Indian History, and then came out to India in October 1901, joining the staff of one of the large mercantile firms in Bombay. He at once gave his valued assistance to the Society, taking in hand the re-arrangement and classification of the Entomological collections, which at that time were in a somewhat neglected state. The amount of steady and patient work that this involved can hardly be appreciated except by those who met him in the museum, where he was to be found working away every evening until it was too dark, or time to catch his train to Andheri, where he lived almost continuously during his time in Bombay throughout all seasons of the year. The work of re-setting the whole of the butterfly collection was alone an undertaking that few would have cared to take in hand.

Mr. Young was elected a member of the Committee and Honorary Secretary of the Entomological Section in July 1902 and became one of the Joint editors of the Journal from the commencement of Vol. XVII, also acting as Joint Honorary Secretary from May 1907 till his departure for home, on account of ill-health, on 29th June the same year.

With a thorough grounding in, and knowledge of, the structure of insects, Mr. Young largely devoted his interest to the intricacies of their classification, paying particular attention to the advocacy of advanced scientific details as a true basis of arrangement. At the same time he was a keen worker in the field so far as his limited leisure time permitted, having a quick hand and eye and a natural aptitude for detecting essential points of interest in habits and life history.

Mr. Young had a ready pen, with a considerable gift of expressing his meaning to the point, and his many contributions to the Journal included papers on the Classification of the Lepidoptera Papilionina, the Enemies of Insects, the Distribution of Butterflies in India, What is a Species? and the first three parts of a serial article on the Common Butterflies of the Plains of India, which was being illustrated with coloured plates. He had also prepared the index of scientific names for Vols. XV, XVI and XVII.

The loss of Mr. Young is one of the greatest that the Society has experienced for many years as it is genuine, steady workers at the collections and in the museum such as he, that has enabled the Society to attain gradually to its present position.

MISCELLANEOUS NOTES.

No. I.—A NEW TORTOISE FROM TRAVANCORE.

I see that in the description Mr. Boulenger gives of "A new tortoise from Travancore," he says he received the two living specimens, from which he drew it up, from Major Dawson. This is a mistake, as they were procured and sent by Mr. T. F. Bourdillon, Conservator of Forests, at my request.

With reference to the height to which these tortoises ascend the hills, Mr. Bourdillon informs me that my impression that 1,000 ft. was the limit is wrong, as he has found them at Pormerd at 3,000 ft.

HAROLD S. FERGUSON.

No. II.—THE BIRDS OF CHITRAL.

In May 1904 the Society received a most interesting series of bird skins collected by Capt. G. A. Perreau in Chitral, which, following on those collected by Capt. H. Fulton (see Vol. XVI, pp. 44 and 744), will probably be found to make the list for that region fairly complete. The doubtful species were identified by me at the British Museum (Natural History).

The following 22 species were included in Capt. Perreau's collection which were not in Capt. Fulton's list, *viz.*:—

(530) *Sturnus porphyronotus*, The Central-Asian Starling.
(557) *Muscicapa grisola*, The Spotted Flycatcher.
(618) *Saxicola picata*, The Pied Chat.
(620) ,, *opistholeuca*, Strickland's Chat.
(624) ,, *œnanthe*, The Wheatear Chat.
(628) ,, *chrysopygia*, The Red-tailed Chat.
(642) *Ruticilla erythronota*, Eversmann's Redstart.
(644*a*) ,, *phœnicura*. This is the first authentic specimen of this Redstart that has been recorded from British India, and it can consequently now take its definite place in the list of Indian birds.
(651) *Calliope pectoralis*, The Himalayan Ruby-throat.
(712) *Accentor nepalensis*, The Eastern Alpine Accentor.
(717) *Tharrhaleus fulvescens*, The Brown Accentor.
(741) *Pycnorhamphus icteroides*, The Black and Yellow Grosbeak.
(745) *Pyrrhula aurantiaca*, The Orange Bullfinch.
(763) *Erythrospiza githaginea*, The Desert-Finch.
(774) *Fringilla montifringilla*, The Brambling.
(792) *Emberiza leucocephala*, The Pine-Bunting.
(795) *Emberiza buchanani*, The Grey-necked Bunting.
(813) *Hirundo rustica*, The Swallow.
(830) *Motacilla hodgsoni*, Hodgson's Pied Wagtail.
(844) *Anthus similis*, The Brown Rock-Pipit.
(865) *Calandrella acutirostris*, Hume's Short-toed Lark.
(874) *Galerita cristata*, The Crested Lark.

BOMBAY, *December*, 1904.

E. COMBER, F.Z.S.

(This note was mislaid and is printed now for the purposes of record—EDS.)

No. III.—BREEDING SEASONS OF DEER.

Following up the notes that have appeared in the journal lately, I have to record the following observations in the Bankapur Taluka (West or Forest region) of the Dharwar district on or about the 1st April 1907:—

(1) Four doe Chital (*Cervus axis*) with five fawns, one doe having two fawns. All the fawns were about the same age and between 2 and 4 months old.

(2) Two doe Muntjac (*Cervulus muntjac*) with three-quarter grown fawns.

CAMP, DHARWAR, *2nd April*, 1907. C. HUDSON, I.C.S.

No. IV.—OCCURRENCE OF *ORNITHOPTERA MINOS* IN THE AHMEDNAGAR DISTRICT.

It may perhaps interest those who turn their attention to butterflies for me to record that on the 10th February last I took a specimen (female) of *Ornithoptera minos* at a place called Láképhal in this district. This butterfly is, I believe, unknown in this part of the country and, in order to make sure of it, I sent the specimen to Mr. T. R. D. Bell, who gave me the name.

CAMP VIA AHMEDNAGAR, *5th April*, 1907. W. G. BETHAM, I.F.S.

No. V.—OCCURRENCE OF THE DUSKY OUZEL (*MERULA FUSCATA*) AT BANNU.

On the 7th April I shot a Dusky Ouzel (*Merula fuscata*) here. According to the Fauna of British India, Birds, this species is rare in India and has only been obtained within Indian limits in Assam and Burma. Its occurrence in the N.-W. F. Province must therefore be looked upon as somewhat remarkable.

BANNU, *9th April*, 1907. H. A. F. MAGRATH, MAJOR.

No. VI.—CURIOUS BEHAVIOUR OF *AQUILA HASTATA*, THE LESSER SPOTTED EAGLE.

I witnessed the following curious behaviour on the part of *Aquila hastata* in Nepal last month. I found an eagle's nest rather late one evening and after a deal of beating the tree and throwing sticks, an eagle flew out, so I returned early next morning with a climber to search the nest. The eagle was plucking green leaves in a tree about fifty yards from the nest, and on seeing us approaching, she at once flew to the nest, and after fumbling about in it, flew away but dropped something from her claws after going about thirty yards which my man at once pronounced to be an egg, and on going to the spot where it fell we found it was so, a perfectly fresh egg, but of course smashed to pieces. There was no other egg in the nest; the bird was shot and proved to be *Aquila hastata* and would not apparently have laid another egg.

Two days afterwards I found another nest of the same species in which the bird could be seen sitting, but she absolutely refused to move for sticks and stones, though she shifted about a little, so at last I fired off a gun when she flew away. This nest contained two fresh eggs, one of which had two holes in it, evidently made by her claws, and there seems little doubt she was thinking of removing the egg when startled by the report of the gun. It would appear therefore to be a habit of these birds to endeavour to remove their eggs when danger threatens, and I should be glad to know if other observers have noted this ; the species is noted in Oates and Blanford as robbing other birds' nests.

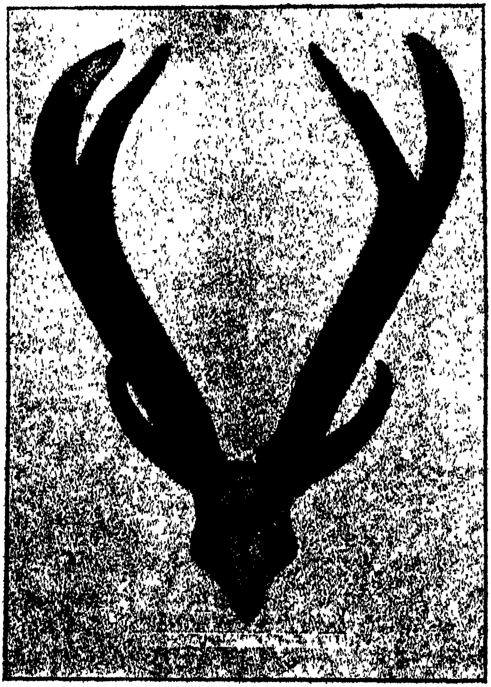
I have several times suspected *Spizaëtus limnaetus* (Changeable Hawk Eagle) of throwing out their egg (or dropping it elsewhere if the nest is searched before the egg is laid) as on two occasions on re-visiting the nest I have found the remains of what is apparently their egg on the ground near the nest ; these birds hang round the nest for weeks, even sitting in it and screaming, when it is approached, but I have never got an egg in such cases ; however this species was suspected of this habit by Fielden in Burma as mentioned in Hume's Nests and Eggs.

S. L. WHYMPER.

JEOLIKOTE, 10*th May*, 1907.

No. VII.—A MASSIVE SAMBAR HEAD.

The accompanying photo and measurements of a Burmese Sambar head will, I think, be of interest.



It is of course nothing in the way of length, but is the most massive horn I have ever seen. I append the measurements:—

	Right horn.	Left horn.
Round burr	9¼″	9½″
„ middle	8⅜″	7½″
„ just below foot...	11″	10″
Length outside curve	27¾″	27¾″
„ straight	23″	23½″
Span between top points	13″	
„ „ brow antler points ...	12½″	

The rule shown is an ivory rule.

T. A. HAUXWELL, I.F.S.

RANGOON, *6th April*, 1907.

[For the sake of comparison it may be interesting to mention that we have in the Society's Museum a single Sambar horn which measures as follows:—

Girth round burr...	12¾″
„ „ mid beam	9 ″

This horn was presented to us by Mr. S. A. Strip of Wadhwan, who sends us the following note in regard to it:—

" Some twenty-five years ago H. H. the late Raja Jetsingji of Chhota Udepur in Rewa Kantha was out one day beating for *shikar* in the jungles of his territory. In one of the beats the sambar, carrying this lovely pair of antlers, was put up, and instead of going to the guns, broke back, and while passing through the beaters, was shot by one of them who happened to have a common single barrel gun. The antlers were removed from the skull, and the one in question, after being mutilated and lying about in the Durbar for years, was given to me by one of the Raja's sons who was a student in the college here (Wadhwan)."—EDS.]

No. VIII.—OVOVIVIPAROUS HABIT OF THE PAINTED TREE SNAKE (*DENDROPHIS PICTUS*).

A specimen of *Dendrophis pictus* has just come into my hands which establishes the fact that this species is ovoviviparous.

The specimen, except for being decapitated, was in excellent preservation and was killed on the 27th of May. It measured 3 feet 8¾ inches, the tail accounting for 1 foot 3 inches.

It was found to contain 7 eggs in abdomina. These were unusually elongate, and varied somewhat in length. The largest was 1⅜ inches, the shortest 1¼ inches, and both were ⅜ an inch across.

They were invested with a white kid-like envelope, and were uniformly white in colour. It was obvious, from their slight translucency, that they contained embryos. They were cut into, and the embryos shaken out of their membranes under water. They were extremely gelatinous owing to the early stage in their development, and were, in consequence, extremely difficult to manipulate, even with a camel's hair brush, without damage. They appeared to me to be in different stages of development, the embryo from the egg nearest to the cloaca, yielding better results than those placed farthest away, the foremost two of which were too tender to make any observations from, breaking up on the slightest touch.

The length of the embryo, allowing for the convoluted form, some folds of which could not be unravelled, I estimated measured about one inch, the head was about $\frac{1}{31}$ of an inch long. The eye was partly developed, and the heart appeared stomach-shaped and could be seen pulsating. I thought I could perceive three branchial clefts below the mouth gap, but the creature was too minute to speak positively on such a point. I could discern no rudiments of fore limbs.

F. WALL, C.M.Z.S., MAJOR, I.M.S.

DIBRUGARH, 28*th May*, 1907.

No. IX.—DO BATS EAT BIRDS?

In reply to Mr. Ernest Green's inquiry, Do bats eat birds?—on page 835 of Vol. XVII of the journal, I can inform him that birds form a large proportion of the food of *Megaderma lyra.* It is surprising that the ways of this ghostly beast have so long remained unknown. Blyth found one in the act of carrying a small bat which was bleeding from a wound behind the ear, and his observation has been quoted in every book on the subject that has been published since, as a proof that *M. lyra* has undoubtedly carnivorous propensities. And this has been our stock of knowledge on the subject, while the bat has been nightly leaving the remains of its feasts in our bed-rooms and verandahs. It is long since I kept *Megaderma lyra* and made the astonishing discovery that the first part of a bird (a sparrow was the species experimented with) which the bat eats is the head. Its jaws and teeth must be comparable to those of a hyæna. It also captures and eats mice and frogs. The headless trunk of a tame mouse which had escaped from my cage was found in the morning in the cage of *M. lyra.* I do not know how they catch mice, but I imagine they flop down upon them with wings outspread. Unlike other bats, they have not the least difficulty in rising from the ground. They catch birds of course off their roosting places. They may often be seen flitting about trees after dusk, manifestly on this quest.

E. H. AITKEN.

THE RED SEA, 21*st May*, 1907.

No. X.—SOME ADDITIONS TO THE BIRDS OF INDIA.

(1). *Fringilla cœlebs.* The Chaffinch.

This species appears to be a rare winter visitor to the Miranzai valley (Kohat District) *N.-W. F. P.* I first came across it on the 2nd March 1906 in a small orchard. There was a pair and I shot one (the female), and sent it to Mr. Bowdler Sharpe who identified it as being of this species.

This year, on the 11th February, I again saw one near the same place; it was a male in good plumage.

Major Magrath, 51st Sikhs, F. F., very kindly exhibited both the Linnet and Chaffinch at a meeting of the British Ornithologists Club (*vide* Bulletin B. O. C., XIX) last October.

(2). *Ampelis garrulus.* The Waxwing. I saw this beautiful bird on 11th December 1906 near Fort Lockhart (Sanana Range, alt. 6,500′), but only got a glimpse of it. Just as I had got my glasses on to it, a flock of Himalayan Gold Finches came up and began mobbing it, and off it flew, uttering a low whistling note, and I never expected to see it again. Though from its crest and general appearance I was pretty sure of its identity, I could not be absolutely so. However on going to this same place five days later, I was agreeably surprised to find it again there and lost no time in making certain of it. It was a female, in lovely plumage, with 4 wax-like tips to the secondaries of each wing.

This is not a solitary occurrence. Major Magrath procured a male at Bannu, 40 miles south, in March, and it looks as if there had been an irruption of Waxwings into N.-W. India this winter.

C. H. T. WHITEHEAD, LT., 56TH RIFLES, F.F.
FORT LOCKHART, N.-W. FRONTIER, *6th April* 1907.

No. XI.—NESTING NOTES FROM THE N.-W. FRONTIER.

Ægithaliscus leucogenys. White-Cheeked Tit.

Mr. Oates in the "*Fauna of India, Birds,*" says that this species is apparently confined to a small tract to the north of Gilgit (Kashmir). However in the Upper Kurram Valley some 400 or 500 miles south-west of Gilgit it is common in the ilex scrub between 6,000 ft. and 8,000 ft. alt., and is probably a resident. It breeds early; a nest found on the 1st May contained fully fledged young, and five others found within the next 2 or 3 days all held young—only 1 nest was found with eggs.

The nest resembles a Long-tailed Tit's, but is much smaller and is not quite so beautifully finished. It is composed of moss, intertwined with cobwebs, and is well-lined with hair with a thick inner lining of feathers. How so tiny a dwelling can accommodate a big fledged family with a parent is difficult to imagine.

It is generally placed close to the top of a small ilex, 4 to 8 ft. from the ground, and is not, as a rule, too difficult to find.

The eggs of the one clutch I got were pure white, 3 having a very faint zone of pink spots round the large end, the other two being unmarked, they averaged ·6″ × ·38″. The clutch appears to be from five to eight. The young resemble their parents, except that the colours are duller, and the black of the chin and throat is replaced by a few indistinct dusky streaks. This bird is a common winter visitor to the Samana Range, and a few descend to the Upper Miranzai Valley (2,500′—3,500′ alt.).

Tichodroma muraria.—The Wall Creeper.

In the "*Fauna of India, Birds,*" this is said to be merely a winter visitor to India. However, though I did not actually find its nest, I came on a lately fledged family on the 11th July, picking about amongst the rocks on Sikarám (Kurram Valley) at 14,500′ alt. The one I shot still had bits of down sticking to its feathers, the wing and tail quills were not fully grown, and the bill was quite soft and short. This bird is a fairly common winter visitor to the Samana and the plains of Kohat.

Phylloscopus subviridis.—Brooks' Willow Warbler.

This species breeds commonly on the wooded slopes of the Safed Koh (Kurram Valley) between 7,000′ and 9,000′ alt. A nest found on July 13th was placed in the bank of a nullah under a bush. It was of the usual Willow Warbler type, made of coarse grass and thinly lined with goat's hair. The eggs, four in number, were white, spotted with red, and measured ·55″ × ·42″.

Mr. Bowdler Sharpe confirmed my identification of the parent. I arrived too late last year to find more nests, but young ones, just able to fly, were seen everywhere. It is a common winter visitor to Kohat, but is only found on the Samana on migration.

Saxicola capistrata.—The White-headed Chat.

Colonel Rattray in his article on "Birds Collected and Observed at Thall" in Vol. XII, page 337, writes that although this species is stated in the "*Fauna of India, Birds,*" to be a constant resident in the plains of the Punjab, he had never seen it there himself in the summer though he had looked out for it, but that at Parachinar (Kurram Valley), alt. 5,700′, he had found it common in July, and that there were lots of young ones about then. Major Magrath and I have also looked for it in vain in the summer in the plains, though in autumn and winter (from the end of August till April) it is common.

On arrival at Parachinar in mid June last year, I found it common on the stony plain around (4,500′ to 7,000′ alt.) and nesting in the banks of the many nullahs which cut up this plain. The nest is usually placed in a bush under a stone or in a hole, but occasionally in a cairn, and is a slight cup-shaped structure, made of grass. The eggs are pale bright blue, marked with red, which varies a good deal in shade. In a clutch Major Magrath found this year the markings were scarcely perceptible. The average measurements are ·78″ × ·60″. The clutch is five and two broods are hatched out. A few pairs ascend the Safed Koh to breed; I saw one family at 9,000′ and many (probably the majority) cross the Peiwar Kotal into Afghanistan.

Accentor nepalensis (Brit. Mus. *rufilatus*).—The Eastern Alpine Accentor.

Major Buchanan, 4th Sikhs, in a note to the journal, Vol. XV, p. 132, states that he found the nest of this bird at 13,500′ alt. in Kashmir, but describes the eggs as being pinky white, speckled and spotted with red. Now this is quite different to the eggs of the Alpine Accentor, which are plain blue, as also are my specimens of those of the Eastern form. This bird breeds all along the Safed Koh from about 12,000′—15,000′ alt. I came across the first nest on July 1st; it was placed under a rock on the hillside, and was beautifully constructed of roots and grass, and lined with moss and a little mouse-hare fur, and contained 3 sky-blue eggs. Both eggs and nest reminded one very much of those of the Hedge Sparrow. The eggs measured ·91″ × ·6″; the clutch appears to be three. Two other nests I saw were placed in clefts of a cliff, and this seems the favourite site. This is not, I think, the first record of the nest. Mr. Stuart Baker has, I believe, an authenticated clutch found previously to mine.

Pycnorhampus carneipes.—White-winged Grosbeak.

In summer this bird is found in the Safed Koh between about 8,000′ and 11,000′. It is not nearly such a shy bird as the Black and Yellow Grosbeak. I found a nest with two hardset eggs on July 6th in a juniper at 8,500′ alt. It was cup-shaped, very neatly made of twig and heath and well lined with fresh strips of juniper bark, and about 3′ from the ground. The eggs were French white in colour, blotched and scrawled with red brown, like a hawfinch's, and measured 1·18″ × ·72″.

C. H. T. WHITEHEAD, Lt., 56th Rifles, F. F.

Parachinar, Kurram Valley,
N.-W. Frontier, *6th May*, 1907.

No. XII.—AN INDIAN DORMOUSE.

One day last summer whilst out looking for nests in the Safed Koh (Kurram Valley, N.-W. Frontier) at about 10,000′, my guide, my old and much weather-worn Ghilzai, beckoned to me and pointed to a wee creature crouching under some brushwood. Just as I made it out, it took fright and scurried up the hill with us after it, finally taking to a tree, which it ran up like a squirrel. Not knowing the little beast I shot it. On going back to the spot where I had first seen it, I was sorry to find a nest with new born young; it was a round ball of grass hidden under a tuft. However I sent the skin and the young in spirit to the British Museum, and Mr. Bonhote has since written and told me that its scientific name is *Eliomys nitedula*, a Palæarctic dormouse, ranging from the Alps to Persia, and not hitherto found East of Persia.

This year I picked up a dead one at 6,500′, which appeared to have been killed a few hours previously by some bird of prey. It was fully grown and closely resembled my first. The following is a rough description of it:—

Tail long and bushy; ears large and rounded. The general colour above is earthy to rufous brown, below buffy white. There is a broad black stripe from the muzzle to the ear.

Measurements: (1) Head and body 100 m.m. (2) Tail 80·5 m.m. (3) Hind foot 19 m.m. (4) Ear 16 m.m.

C. H. T. WHITEHEAD, LT., 56TH RIFLES, F. F.

PARACHINAR, KURRAM VALLEY, N.-W. FRONTIER, *6th May*, 1907.

No. XIII.—SOME NOTES ON WILD DOGS AND PANTHERS.

I was shooting for six weeks last April and May in an out-of-the-way part of the Nimar District, in which only two tigers had been killed in the last eight years or so. I expected to find about eight tigers of sorts in it. There were five all-told, including two little cubs, too small to run with their mother. There were two or three packs of wild dogs, and a large number of sambhur and bears, also several panthers The wild dogs, as usual, interfered very much with one's sport. They appeared to me particularly bold in this jungle. They growled at me two or three times, and just before I left the jungle I heard that four or five of them had attacked two forest guards, who killed one dog with an axe. The Forest Ranger informed me of this. So bold are these brutes that I am afraid they may take to killing men. They killed several calves while I was in the jungle, and also six of my tied-up buffaloes.

One evening close to my camp I came on a pack evidently hunting but running mute. I waited on the road within a hundred and fifty yards of my camp. Soon a half grown sambhur came galloping by within ten yards but paid no attention to me. About two minutes afterwards the same sambhur galloped by from the same direction and passed within five yards of me. A big wild dog was hanging on to its belly. He let go when he saw me, and I shot him. I do not know what became of the sambhur. A few days afterwards in the early morning my men came on some wild dogs chasing a panther, a female I think. They said the panther had climbed a tree. Later I went out and found fresh claw marks of a panther up a "Karhai" tree. It had climbed up about ten feet. At the foot of the tree were the nail marks of the dogs where they had been jumping at the panther. A few days afterwards the wild dogs killed one of my tied-up buffaloes. Half was left. I made a strong solution of strychnine and injected it with a syringe into the muscles, and I also scored the flesh and rubbed in strychnine and arsenic. I came back in about an hour, and found about a dozen dogs drinking at a pool close to the kill. As I watched one became convulsed and fell down dead. I expected to see more die, so would not shoot. I then walked up towards the dogs, and they went slowly off. Then one came back, seized the dead dog by the scruff of the neck, and began to drag it away. I shot this dog. It was a female, in the prime of life, and had produced at least one family. The poisoned dog was a two-thirds grown male, and probably his mother tried to drag him away. I found no more dead dogs, but three or four places where they had vomited up meat. The dogs had eaten up all the poisoned remains of the buffalo.

Another day, in the evening, I killed a wild dog which was coming alone to water, ahead of the pack which followed not far off. I cut off the tail, and a strip of skin from the tail to the ears, and left the remains on a footpath. Next day I went back. The dead dog had been taken away, and apparently by wild dogs. It had certainly not been eaten on the spot. There were no marks of a panther or hyæna.

Do wild dogs carry off and bury their dead under leaves or in a hole?

As strychnine rubbed into flesh does not prove fatal, can anyone suggest a better plan for getting rid of these pests? Is any other possible poison more deadly? I should have liked to try surrounding a pack of dogs with about fifty jungle men, armed with axes and lathies, and think it possible one could almost exterminate a pack in this way. The local forest guards said they would try it. We must kill these brutes or they will soon become man-eaters.

Perhaps the number of wild dogs in this jungle accounts for the paucity of tigers. Possibly the wild dogs find and eat the young tigers while the mother is away. But I have seen a jungle where there were many tigers, and many wild dogs.

I am sending you the heart of a male panther (7′-5″ round curves). I shot him through the heart at fifty paces with a ·577 rifle (low pressure cordite and copper tube bullet). You will see that both ventricles have been torn open. The heart lies flat on your hand with no cavities. This panther rolled over to the shot, then galloped up a steep hill for thirty paces, circled round and rolled over dead ten yards from where he started, having run seventy paces. There was a heavy blood trail the whole way. From the start not a drop of blood could have been pumped into the arteries by the heart.

I was also shown the body of a wild boar about twenty feet up a tree. The villagers who showed it to me said the boar, which was half grown, had been killed by a panther and put up the tree. Of course, I know this is common enough, but this particular tree had a large trunk and no branches for many feet.

F. W. CATON JONES, Lt.-Col., R.A.M.C.

Kamptee,
June 13th, 1907.

No. XIV.—THE CLIMATAL CHANGES OF *MELANITIS LEDA.*

May I offer a few remarks on this very interesting subject, raised in the last number of the Journal, page 709, begging indulgence if I make mistakes in the absence of my books and collection. I never made experiments like Col. Manders, which I regret, but I have observed the seasonal changes of butterflies for many years. There are few species that do not exhibit the phenomenon in some degree and it is impossible to compare the various aspects of it presented by different species in different places without inclining to Mr. Young's opinion, that the cause will be found in the food of the larva. Now the growth of vegetation does not depend on temperature, nor on humidity, but on the combination of the two, and it is to this combination, I believe, that we must look for the true explanation of the seasonal variation and the local variation of butterflies and moths. Let us take the local first. If two collections, one from the plains of India and one from the coast of Canara or Malabar, are put side by side, the latter will be found to be conspicuously darker and richer in colour. In some species the difference is striking. Specimens of *Danais limniace* from the warm and humid southern coast are so different from Bombay specimens that I actually sent some to the late Mr. de Niceville for his opinion whether they were *limniace* or *septentrionis*. He decided, not without hesitation, that they were *limniace*. A more remarkable case is that of *Nepheronia gaa*, a common Bombay butterfly, which is found in Canara also, but only in the cold season, its place being taken, in the monsoon, by *N. pingasa*, a very dark form not extending to Bombay. I believe this to be merely a monsoon form of the other, which the moisture and warmth of Bombay are not quite sufficient to produce. To come to seasonal variation, *Hypolimnas bolina* presents an instructive illustration. Here there are not two forms, but a regular gradation. The first specimens which appear in the rains, emerging from the latest pupæ of the previous November or December, which have hibernated or æstivated through the dry months, are scarcely larger than *H. mysippus*, dull in colour and marked with a broad whitish fascia on the underside. The next brood is very different, but it is not until August that we get, in its perfection, the magnificent butterfly that used to be distinguished as *H. avia*. The food plant of this species is a monsoon annual, but *Melanitis leda*, or *ismene*, feeds on grasses and is found all the year, in two well marked forms, of which one displaces the other suddenly in Western India just when monsoon conditions have ceased. Now, if the change is a result of the nutrition of the larva, and the larval and pupal life extends to six weeks, as Col. Manders shows, then it is evident that we must look back about two months from the appearance of the butterfly to find the conditions that produced it. Apply this to Col. Manders' tables. The month in which most rain fell was January, the next March, the next December: from January to March inclusive only wet-season forms were taken. With the decreasing rainfall of April and May we have first intermediate and then dry-season forms in June and July, which culminates in June with only 6·46 inches of rain, and August without a single specimen of the wet-season form. All the months do not answer so unequivocally, however, and I would suggest experiments in feeding larvæ, some on abundance of the most succulent food obtainable and some on dry fare. The latter must not be starved, or their growth will be stunted, which is not the case, as a rule, with the dry-season form of any butterfly; on the contrary, it is generally larger than the other. I feel sure that experiments on this line, carried out with the perseverance and care of Col. Manders, would yield valuable results.

E. H. AITKEN.

THE RED SEA, *22nd May*, 1907.

No. XV.—OCCURRENCE OF THE SIBERIAN BLUE CHAT (*LARVIVORA CYANEA*) IN THE HAZARA DISTRICT.

On the 20th of June, when searching for the nests of *Larvivora brunnea* (The Indian Blue Chat), a common bird up here, I came across, under the following circumstances and much to my astonishment, a pair of *Larvivora cyanea* (The Siberian Blue Chat). I was seated among thick bushes on the side of a rocky and precipitous hill, when I became aware of a small brown bird perched on a twig in front of me. At first I thought it was a female *L. brunnea*, but the smaller size, the whiteness of the throat and breast, and the amount of rufous on the tail puzzled me considerably. While I was looking at her, she gave a call note and presently hearing a rustle on my right, I turned slowly round and saw not more than 8 or 10 feet from me what I have little doubt was a male *L. cyanea*. It differed from *brunnea* in the absence of the white supercilium and rufous breast, the throat being white and the breast a dirty buffish white. It also appeared smaller. In other respects it resembled *brunnea*. I had a good look at the bird through glasses, as well as with the naked eye, before it was lost to sight in the thick cover below. For a week following I haunted the vicinity of the spot where I had chanced on these rare birds, but unfortunately without again seeing them. The pair must have nested somewhere on the hill.

H. A. F. MAGRATH, MAJOR.

THANDIANI, HAZARA DIST., *27th June*, 1907.

No. XVI.—THE ENEMIES OF SNAKES.

The following was communicated to me yesterday by an officer stationed here, and, as the incident strikes one as out of the common, I am sending you the description for record in the Society's Journal :—

"Our full grown Buff Orpington fowl was reported to me by my sweeper to be ill. I went and looked at it and found, to all outward appearances, the fowl was perfectly fit, but it seemed to have something wrong with its throat as it kept on coughing and I felt a hard substance in its crop. In the course of 28 hours it died, and I had it cut open and found in it a snake eighteen inches long."

M. B. ROBERTS, MAJOR,

1-39th Garhwal Rifles.

LANSDOWNE, GARHWAL, U.P., *24th June*, 1907.

No. XVII.—DIFFERENTIATION OF SPECIES.

In taking up the subject of Natural History generally, and of that part which deals with birds in particular, the budding naturalist must frequently be puzzled as to the reason why two birds, which resemble each other very closely in almost every detail, should be separated as two distinct species; and then again, another pair, which even to his uninitiated eye appear quite different, are classed as one and the same bird probably from two different parts of the country.

In this respect, the Raptores of India, perhaps more than any other family or order, produce the best examples to illustrate my meaning. In many cases the *Falconidæ* undergo vast changes, from the young to the adult plumage, but that is not all, for once a series is obtained showing the varied plumages from the nestling to the two-year-old and thence to the adult. the problem would be solved if such were the case, and even the novice would be able to see at a glance, by comparing with the series, what he had got, but the trouble comes in when a nestling plumage, even, is not constant, as in *Buteo ferox*, the Long-legged Buzzard; or again as often happens, two specimens of the same species are procured, presumably of the same age, but in one case the specimen has undergone a perfect moult into the next dress, whereas the other only a partial one and still retains many feathers of the previous year's plumage, and thus the two would present quite a different appearance to each other.

To return, however, to my original discussion, *i.e.*, the similarity of two distinct species to one another and then again the difference in two others of the same species. If each of these local changes were to be given generic or specific rank, there would, absolutely, be no end to the numbers, but then again the question crops up, where and how is the line to be drawn? As an example of the variable types of one species, let us pick out *Spilornis cheela*, the Crested Serpent Eagle. If each variety of this eagle to be found in India was to be classed as a distinct species, as it formerly was, we should have at least five extra species in this one alone. Apart from the difference in size between the Northern India type and that of Ceylon and Southern India, we find vast changes also in plumage. To take the typical form of *S. cheela* as found in N. India and the Himalayas, we find the following characteristics: Breast and fore-neck distinctly barred; throat black, and in adults a single white bar on the tail (Blanford). Another, the common type found throughout India, known as *S. melanotis*, has either none, or very indistinct barring on the breast; very rarely any black on the throat and frequently *two* white bars on the tail. Another form (*S. rutherfordi*) has the barring on the breast as in typical *S. cheela*, but the throat dark ashy gray. Besides these there are other varieties differing in size and in plumage, passing from one phase to the other, till in parts there is no distinguishing one from the other, and this being the case, all these have been incorporated under the one main species *Spilornis cheela*, though the difference in size in some forms is as much as six or seven inches in length, besides the varieties of actual markings above referred to, to say nothing of the shades from the glossy dark brown or black back and almost chocolate breast of the Himalayan variety, to the washed-out dull back and light brown breast of the S. Indian bird.

In the above case, we find a great variety of birds differing in colour and size, which once had specific rank, now united under the one heading.

So much for limiting species, and now let us consider the other side of the question. To do this let us go back, in the first instance, to the Hawk-Eagles (*Spizaëti*) The distinction between *S. nepalensis* and *S. kelaarti* seems so trivial that one wonders what justification there is for giving each specific rank. Legge gives as a reason for the separation, the size and robustness of the claws and foot; but according to Blanford, two skins were procured in Travancore, which is quite out of the range of *S. nepalensis*, of *S. kelaarti*, in which the claws were not larger than those of *S. nepalensis*. In any case, I would not lay much stress on a point in which the difference is so slight; for even in many birds, procured in exactly the same place, there might easily be a difference of a fraction of an inch in the length and thickness of claws.

If the question of claws and an inch or two in measurement be dispensed with, we only have the colouring left to contend against. In *S. kelaarti* the markings are more or less identical with those of *S. nepalensis*, only less pronounced, or in a lighter shade, and the chief difference lies in the white bars on the breast feathers being intercepted by the shaft in one case and being continuous in the other. If, as in the case of *Spilornis*, the entire question of barring and colouring is not sufficient to separate the various types, why should such a very small diversity be enough to separate *S. nepalensis* from *S. kelaarti*? Why should one not be considered the Southern India variety of *S. nepalensis* or *vice versa*? Such anomalies seem hard to explain.

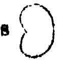
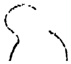
From this case to the next, which in times past has been the subject of much controversy, is only a step, but still the step is a long one.

The Steppe Eagle (*Aquila bifasciata*) has been in turn confounded with The Imperial (*Aq. heliaca*), The Tawny (*Aq. vindhiana*) and even with the Large Spotted Eagle (*Aq. maculata*) till Messrs. Brooks and Anderson finally stepped into the breach and solved the problem.

In the days when *Aq. bifasciata* was considered only a phase of the immature plumage of *Aq. heliaca*, it is strange that it never struck anyone to pause and consider why there should be such an enormous proportion of birds in immature garb to those in adult dress. Taking the dark, almost black, plumage with the buff head and white barred tail as the type of the adult dress of *Aq. heliaca*, we find the species fairly well distributed, but by no means common anywhere, while during the winter the Steppe and the Tawny are by far the commonest eagles in N. India at any rate, and to every one typical Imperial in adult plumage one sees during a day's shoot, at least 15 to 20 "Steppes" will be seen.

Should there be such a preponderance of birds in immature garb over those in full adult plumage, is a question that would almost naturally occur to one, and the answer would be no ; it should be just the other way about. This fact alone should have decided that there was something wrong.

The Steppe in most cases is certainly Imperial Eagle size and resembles the immature plumage of *A. heliaca*, except that in the latter the breast is striated, which is never the case in *A. bifasciata.* The separation of those two is, no doubt, reasonable ; for though resembling each other in the young plumage, it is there the resemblance ceases and *A. bifasciata* never becomes dark like the adult *heliaca.*

The excuse for the Tawny and the Steppe being taken for different phases of each other, is justifiable, except for one important structural difference, *viz.*, the nostril, as otherwise they resemble each other very closely in colouring, habits, flight and even their call. A very distinctive feature of *A. bifasciata* is the two bars on either wing, formed by the white tips to the secondaries and greater coverts and conspicuous in most specimens, even at a great height up, but unfortunately this feature is not constant. I have seen specimens in which the secondaries and coverts themselves were so light and faded, bleached perhaps from exposure, that the white tips were hardly noticeable and the bars very indistinct, if traceable. Then, again, a Tawny Eagle will often be found to have light tips to the coverts, forming a hazy bar on the wing, not at all unlike that of *A. bifasciata.* If this were all the difference, *viz.*, the white bar and size, for the Steppe is usually bigger than the Tawny, they might safely be classed as one species, one being resident in India and the other a winter visitor from the north ; but the difference in the shape of the nostril must keep them apart, but strangely enough here too the characteristic is not constant. Some specimens have the long oval, like *A. heliaca* ; others again with the line on the outer edge broken in the centre, thus  ; some are broader at the lower end than at the top, thus  or even *vice versa,* but though varying in detail, the actual long elongated oval remains more or less the same and can never be taken for the *almost* round, though still higher than broad, nostril of *A. vindhiana.*

Yet this point was seemingly not taken into account when *A. bifasciata* was considered to be a phase of *A. vindhiana.*

The young plumages of *A. vindhiana* are so very variable and in many cases seem to pass into those of *A. bifasciata* or those of the latter into those of the former, that to take one for the other, without looking at the nostril, is quite excusable, as one (*A. bifasciata*) might easily have been regarded as the northern migratory form of the other.

However, the fact remains, that in the case where there is an important structural difference, the two species should have been considered as one and the same bird for a long time, whereas in another instance, where the chief difference lies in a minute brown-hair like line (the shaft) dividing the white band across the breast feathers in two, the point has been generally accepted as sufficient to separate birds and give specific rank !

Time will no doubt revolutionize all our present standards, and birds we have hitherto considered as absolutely distinct species, will be found to be variable phases of one and the same; and others, which we now consider simply local types, will be given specific, if not generic, rank, for there is undoubtedly much yet to learn with regard to even our commonest species. Orthodoxy in questions relating to Natural History appears to be a mistake, and many of our long-cherished illusions, based upon the precepts and theories of irrefutable authorities, crumble and fall to the ground year after year, and the more one sees of nature and her ways, the less inclined does one feel either to lay down standards for oneself, or accept those of others without due consideration.

C. H. DONALD, F.Z.S.

Bhadarwa, 31*st May* 1907.

No. XVIII.—A VISIT TO SOUTH SENTINEL ISLAND.

On February 16th I managed to land on the interesting and unfrequented island of South Sentinel in company with Mr. P. F. Wickham. The object of our visit was if possible to observe the nesting habits of the Pied Imperial and Nicobar Hackled Pigeons.

I had obtained the young of both these pigeons on this island in March of the previous year, so felt confident we should get the eggs.

South Sentinel is a coral island about a mile long by half a mile broad situated in north latitude 11°, about 17 miles N.-W. of the Little Andaman. It is out of sight of land and a landing can only be effected in calm weather. The highest point of the island is only about 10 feet above high tide level and its centre is occupied by a swamp, the water of which is brackish.

The whole island, with the exception of the swamp, is covered with dense forest, consisting mainly of mohwa trees (*Mimusops littoralis*) with an undergrowth of various smaller trees and shrubs. There is a well-defined sea fence along the shore consisting of screw pines (*Pandanus sp.*) and *Hibiscus.*

In places the mohwa trees are of very large dimensions, but are hollow and evidently long past maturity. It is in the hollows of these huge trees that the celebrated Robber Crab (*Birgus latro*) makes his home. This small island is the only one of all the Andaman group in which this giant hermit crab is found. He is of a fine purplish blue colour and measures about 2 feet across (legs extended) and turns the scale at upwards of 5lbs. He has no protecting shell, for the very good reason that there is no shell large enough to house him and like other hermit crabs he cannot make his own shell. He is nocturnal in his habits, coming out of his arboreal retreat shortly before sundown, and feeding on various jungle fruits. He is an adept at climbing, but so far as my experience goes they feed chiefly, if not entirely, on fallen fruits. Some I kept in captivity were very fond of cocoanuts and papayas.

They have two unequal very powerful nippers, and woe betide the incautious person who allows the animal to close them upon his finger, for he will certainly lose it. One I captured took a firm grip of a boat's cushion, and as it could not be induced to let go, it was placed on board the launch in possession of the cushion and only relaxed its hold 2 hours afterwards!

We found the island swarming with the Pied Imperial Pigeon (*Myristicivora bicolor*) and it was not long before we discovered a nest containing a single fresh egg, followed by many others. Altogether we found some 50 nests containing each a single egg, some fresh, some more or less incubated.

The nests were not, as a rule, close together. They were placed near the tops of small trees or on the lower branches of big ones, usually about 25 feet from the ground. One nest I found was only 10 feet from the ground, but this was exceptional.

The nest is the usual flimsy platform of sticks through which the egg is usually visible from below.

The eggs are of course pure white, generally rather elongated ovals with a fair amount of gloss. The measurements are as follows:—

Longest egg	1·91″ × 1·26″
Shortest „	1·67″ × 1·20″
Mean of 28 eggs............................	1·80″ × 1·24″

Calœnas nicobarica (the Nicobar Hackled Pigeon) was also breeding on the island, but in comparatively small numbers, and we only succeeded in finding two nests similar in structure and position to those of *Myristicivora*. They too contained a single egg each, quite fresh, very similar to those of the Pied Imperial, but slightly larger (average 1·92″ × 1·22″). The *fresh* egg of *Calœnas* may, moreover, be recognized from that of *Myristicivora* by the colour of the membrane underlying the shell, which imparts a delicate purple tinge to the egg of the former, that of the latter being pure white or faintly yellow.

Other birds observed on the island were: *Esacus magnirostris, Lepterodius sacer, Haliaëtus leucogaster, Palæornis magnirostris, Nettium albigulare, Muscitrea grisola, Aracnecthra andamanica* and a rail of sorts, probably *Hypotanidia obscurior*.

The only other inhabitants we saw on South Sentinel were the following:—

A flying fox (*Pteropus nicobaricus*). Very numerous.

A monitor lizard (*Varanus salvator*). Also common. We captured one large specimen 7 feet in length.

Also tree lizards (? *Goniocephalus*) and skinks. Very numerous.

The common edible Turtle. These animals literally swarm round the island, coming on shore in the evening to lay their eggs, which may be dug up in numbers from the nest holes in the sand.

We secured one fine and large turtle as he was trying to escape from the shallows, and turned him on to his back. Eventually, however, we had to let him go, as we had no room for him in the boat.

B. B. OSMASTON, I.F.S.

PORT BLAIR, ANDAMAN ISLANDS,
June 1907.

No. XIX.—EXTENSION OF THE HABITAT OF THE SAND SNAKE (*PSAMMOPHIS LEITHII*).

The habitat of this uncommon snake, as far as was known when the third Volume of Mr. Boulenger's Catalogue appeared in 1896, was Sind, Cutch, Rajputana, and Baluchistan. On the 3rd December 1904 I obtained a good specimen near Rai Bareilly in the United Provinces, and to-day I have received the skin of another specimen from Major Magrath, 51st Sikhs, who obtained it near Thall Fort on the N.-W. Frontier (altitude 2,000 ft.). My specimen was a perfect female adult, 2 feet 1¾ inches long, the tail measuring 7½ inches. The ventrals and subcaudals were 170+95. The anal entire. It was typical in every way. It contained a mouse "in gastro."

Major Magrath's specimen I have identified from the imperfect skin. It is an adult with the anal entire, and the ventrals 172. The tail is absent and the head shields also wanting. These characters, however, do not affect the diagnosis. In both these specimens the belly is creamy white laterally, with a saffron band occupying the median third of its breadth. This band is well defined by a series of red spots, or lines.

F. WALL, MAJOR, C.M.Z.S., I.M.S.

DIBRUGARH, ASSAM, 25*th May* 1907.

No. XX.—THE PRAYING MANTIS.

Mr A. A. Dunbar Brander, in Miscellaneous note No. 1 on page 1013 of Vol. XVII, tells us of a Mantis which "shed its skin like a snake and then proceeded to eat it, commencing at the tail," and he asks the reader to let him know if this process has been previously remarked with regard to the Mantis. As to the first part of the process I am able to answer in the affirmative, having observed the shedding of the skin last May. It seems to be a long established fact that the larvæ of the *Mantidæ* undergo several successive moultings, and the insect, Mr. Dunbar Brander is speaking of, was no doubt a larva. How often the different species are shedding their skins and at what intervals, I am unable to say. I have been observing a larva since the middle of May when it shed its skin for the first time in captivity. Since then no moulting has taken place and I am still waiting for a further development. As to the second part of the process, *viz.*, the Mantis eating its own skin, I did not notice anything of the kind, and I doubt very much whether the larvæ will do it if they get something better and more substantial. I find my Mantis to be very voracious; of about ten flies it gets every day nothing is left, not even the wings. In May I kept several together in the same glass-case and I did not supply them with food. The consequence was that very soon they engaged in a desperate combat, not leaving off fighting till the strongest of them had succeeded after a few days in killing and devouring all the rest. Nothing seems to equal the ferocity of these animals.

E. BLATTER, S. J.

ST. XAVIER'S COLLEGE, BOMBAY,
10*th July* 1907.

No. XXI.—VIVIPAROUS HABIT OF THE FALSE HIMALAYAN VIPER (*PSAMMODYNASTES PULVERULENTUS*).

A nice female specimen of this snake caught in Dibrugarh was brought to me on the 6th of May. It appeared to me obviously gravid, and was kept in anticipation of future events.

I have been mistaken so frequently in my diagnosis of pregnancy, finding in some specimens the obvious distension due to nothing but fat, or in other cases to masses of tapeworms, that as time went by and the specimen refused food, and looked thinner, I resolved to convert it into a Museum specimen, and she was consigned to the spirit bottle on the 6th July.

On cutting her open to my great disgust I found 3 fully formed young in the abdomen, and 3 unfertilised eggs.

The young were so far developed that I think it extremely likely they would have been born within a very few days.

They were perfectly formed, in colour they were as well marked as the mother, and they were perfectly ready to cast their skins as these peeled off with ease. Added to this it was very apparent that the embryo nearest the cloacal opening had struggled within the mother in a vain endeavour to escape when the mother was drowning.

I believe it is not known that this species is viviparous.

The young I could not sex with certainty. They were examined in other respects however successfully. The eye was very large, being in its horizontal diameter one-third longer than its distance to the end of the snout.

No. 1.—Length 5″; ventrals and subcaudals 169+59; 22 intervening between the navel and the anal. Loreal divided $\frac{1}{1}$.

No. 2.—Length $5\frac{1}{8}$″ ventrals and subcaudals 167+60; 21 between navel and anal.

No. 3.—Length $5\frac{1}{4}$″. Ventrals and subcaudals 168+67; 23 between navel and anal.

This last was a light specimen. It had two lateral light bands, the upper involving the 4th, 5th and lower half of the 6th rows above the ventrals, the lower edge of the ventrals, and the lower half of the ultimate costal row. A narrow postocular oblique streak on the temples. A dark narrow subterminal ventral line on each side of the belly.

The mother measured 1 foot 9 inches, of which the tail was $4\frac{1}{4}$ inches. The ventrals and subcaudals were 169 + 64.

F. WALL, MAJOR, C.M.Z.S., I.M.S.

DIBRUGARH, ASSAM,
8th July 1907.

No. XXII.—REMARKS ON THE EMBRYOLOGY OF A SNAKE.

It has been my good fortune this year to acquire snake's eggs with the embryo in a very early stage of development. Doubtless the ontogeny of ophidians has been worked out before by men of much greater ability than myself. I have, however, never seen any account of the development of the snake, and have tried unsuccessfully for some years to see the embryos in a very early stage. I hoped, if I could get them early enough, to be able to throw some light on the phylogeny, through studying the ontogeny.

The youngest embryos I extracted from eggs believed to belong to *Tropidonotus stolatus* and when unravelled measured only 1⅛" in length. The hatchlings of this snake I know to be from 5½" to 6⅜" inches long, so the length of these embryos show they are in a very early stage of development, still they are not young enough yet to satisfy me. The following points arrested my attention. The head posteriorly has a large swelling (the primary cerebral vesicle) denoting the early development of the brain. This is, at this stage, a single rounded eminence. Later it is divided by a median sulcus into two (fig. H). The eye is large, and the pupil discernible. The upper jaw is fully developed, but the lower, which is developed like the upper from the first gill arch, is in a very rudimentary state (see fig. F 2). The mouth is very large. No trace of an external ear orifice can be discerned. Only one gill arch is present, and there are no branchial clefts or fringes. The heart is large, and could be seen pulsating for a long time (half an hour) after removal of the embryo from the egg. The two auricles and the single ventricle are very apparent. I was much disappointed to find no trace of either fore or hind limbs.

Figures G, H and I are from a larger embryo measuring 3 inches. Here the lower jaw is properly developed. The pupil and iris are distinct, and the primary cerebral vesicle is relatively smaller, and has become divided mesially. The genitals in the males are relatively long, and are quite external. At what date they become ensheathed I have not yet been able to discover, but it is late during life within the egg.

Figures A to F shows successive stages in development.

A. The fœtus in membranes.

B. The fœtus still in membranes the head freed.

C. Membranes peeled off, still partially adherent (*a*).

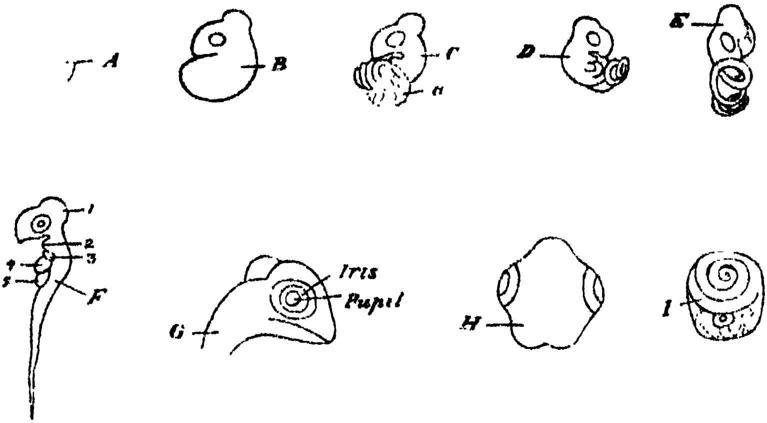
D. In profile showing spiral form of body.

E. Head seen three-quarter view with large cerebral vesicle on top.

F. Fœtus unravelled. 1. The primary cerebral vesicle. 2. Rudimentary lower jaw. 3, 4, 5, Heart.

G. H. Head of another more advanced embryo (enlarged.)

I. The same embryo as G. & H. shown life size lying in its membranes.



F. WALL, C.M.Z.S., MAJOR, I.M.S.

DIBRUGARH, ASSAM,
28*th May* 1907.

No. XXIII.—NOTES ON A SOCIAL SPIDER, *STEGODYPHUS SARASINORUM*, KARSCH.

The genus *Stegodyphus* belongs to the family *Eresidæ*, which latter is divided off from most of the Indian Arachnomorphæ by the possession of a *cribellum* and its complementary organ the *calumistrum*. To save a special reference to those unfamiliar with the anatomy of spiders, it will not be out of place to state that the *cribellum* is a spinning plate placed immediately in front of the spinners, and *calumistrum* is a term applied to a single or double row of short hairs on the protarsus of the fourth pair of legs. The organs are peculiar to a group of Arachnomorphæ including the *Eresidæ*, and one organ is invariably accompanied by the other.

Stegodyphus sarasinorum is a social spider. The members of a colony build a large saccular web mixed with oval passages, somewhat after the pattern of a sponge, of a special dense texture. The special organs above described are no doubt particularly useful for weaving the peculiar web. The spiders may be seen rapidly moving the hind pair of legs back and forwards across the spinning mammillæ and the *cribellum*, and turning out the peculiar texture of web, of which their cities are constructed.

The outside of the web is very viscous and even powerful insects can rarely win free once they have struck it.

The spiders themselves are rarely seen on the outside of the nest after its completion, and one has to tear it open to find them within. The spiders are greyish and the adults are of small size; the total length of the male being 6 mm. and of the female even only 10 mm.

Yet large insects succumb to them, and I have recently found, on a group of webs, several specimens of the Bombay locust- *Acridium succinctum* (a swarm of these locusts visited this place about a month back), some large and tough rose and other chafers and aculeate hymenoptera (too far damaged for identification) of considerable size.

Now these insects are far larger (the locusts are over two inches long) and infinitely more powerful than the spiders, and the latter are by no means formidably armed.

I believe, however, that the spiders do not attack their victims while still alive. I have never actually been able to observe one feeding, but they certainly do not, like solitary web-dwellers, rush forward as soon as an insect is fast in the snare. I have seen several insects struggling on the web and yet not a spider appeared. Again I found a rose beetle so entangled that it could not move, and indeed I imagined it was dead until I had freed it of the sticky threads, and yet it was absolutely untouched by the spiders. It may therefore be inferred that they either allow the trapped insect to die, or, at least, wait till it is quite helpless from starvation, before they start operations. This would be specially necessary with stinging hymenoptera, as the sting could easily pierce through the swathing thread, and the spider is not armoured in any way.

The colonies are built usually on shrubs not more than 8 feet above the ground level and at the ends of branches in exposed positions. One I have particularly observed in the compound of the bungalow I occupy here, is on a bush of *Lagerstrœmia indica* just now out in flower and attracting many insects, so that no doubt the colony is enjoying high living.

Stegodyphus sarasinorum has a wide range, as I have found it common in Ganjam as well as in the lower portion of Coimbatore in the Madras Presidency.

A description of this species will be found on pages 209-210 of the Volume on Arachnida (R. I. Pocock) in the Fauna of British India Series.

DEHRA DUN, C. E. C. FISCHER.
17th July 1907.

No. XXIV.—NATURAL LAYERING OF *DESMODIUM TILIÆFOLIUM*, G. DON.

Recently, when on tour in the North-West Himalayas, one of the students of the Dehra Forest College (B. M. Warde) drew my attention to a shrub of *Desmodium tiliæfolium* about six feet in height, one branch of which was curved back to the ground, and there the tip had taken root and a new erect shoot, about a foot long and bearing several leaves, had sprung up. I cannot find that such rooting of the tip of branches, common enough in some plants, has been previously recorded for this species or indeed of any Indian *Desmodium*.

DEHRA DUN, C. E. C. FISCHER.
16th July 1907.

No. XXV.—ABERRATION IN SCALES OF REGROWN TAIL OF *AGAMA TUBERCULATA*, GREY.

That lizards have the power of regrowing a lost tail is of course well known, but it is perhaps worth while to record that in the case of *Agama tuberculata* the regrown portion does not present the normal arrangement of scales. Normally the scales of the tail are regularly verticillate, but in two specimens (both ♂) secured in North-West Himalayas the scales of the regrown portion were irregularly imbricate, contrasting sharply with the undamaged part. The tail apparently does not grow again to its full size, as in both the above specimens the tail bore a much smaller proportion to the length from snout to vent than was the case with perfect ones.

DEHRA DUN, C. E. C. FISCHER.
15th July 1907.

No. XXVI.—NOTE ON THE BREEDING OF SNAKES IN CAPTIVITY.

In continuation of the Note on the above subject printed at page 808, Vol. XVII, of the Society's Journal, the following may be of interest.

From the table it will be seen that 4 cobras have presented us with eggs, during the month of May, and two Russell's vipers with young ones, in June or July. This corresponds with the usual times previously reported.

Registered Number.	Kind of Snake.	Date of arrival.	Number of eggs and date.	From what place received.
452 ...	Cobra ...	14th April 1907...	16 on 18th May 1907.	Khandwa.
454 ...	Do. ...	18th " ...	18 on 10th " ...	Do.
460 ...	Do. ...	29th " ...	12 on 22nd " ...	Do.
465 ...	Do. ...	10th May 1907 ...	16 on 18th " ...	Do.
114 ...	R. Viper...	5th March 1907.	16 young ones. 13 alive, 3 dead, on 17th June 1907.	Kirkee.
115 ...	Do. ...	4th June 1907...	Aborted 39 eggs with one full grown embryo on 5th July 1907.	Khandwa.

Though every care was taken of the cobra eggs, none of them hatched out. One, which was opened, contained a half-grown snake, the heart of which continued to pulsate for about an hour.

The Russell's viper, which had been in captivity for a little over 3 months, gave birth to 16 young ones, of which 3 were dead. The other viper aborted on the 5th July, producing 39 embryos in ill-formed eggs. The membranous covering of the eggs was very thin and transparent, showing the immature vipers coiled up inside them. It will be seen that two of the 3 dead ones of the first batch are also not fully formed. One is not properly uncoiled, the tail half nearly of the body being still attached to the neighbouring coil. The other, though apparently fully formed, shows about two inches of the duct, which in the egg connected the yolk-sac with the intestines, still attached to and entering the body about one inch in front of the vent.

A sequel to the above may be seen in another bottle. The 13 young vipers were kept together in one box. A few days ago, one of the larger ones attempted to swallow one of its companion's head first and choked itself in consequence. As the engulphed snake showed slight signs of putrefaction when found, it is probable that it was dead before its neighbour tried to swallow it.

W. B BANNERMAN, LT.-COL., M.D., I.M.S.

BO. BACT. LABY., PAREL, 22nd *July* 1907.

No. XXVII.—PECULIAR PROGRESSION OF A COBRA (*NAIA TRIPUDIANS*).

Mr. Barton Wright has written to our Society on the peculiar progression of a cobra he flushed, and pursued in the Madura District, which he says "moved along like a huge caterpillar, hunching his back, and then using his head as a fulcrum to draw himself along."

It took refuge in a hole, was dug out, and when dislodged repeated the same extraordinary method of locomotion.

N.B.—It is difficult to account for this strange behaviour, which, as far as I am aware, has not been reported before so far as the cobra is concerned. All I have seen moved in the orthodox anguine fashion, *viz.*, by a series of alternate, bilateral, horizontal, undulations, so that the whole belly is parallel to the plane traversed.

It occurs to me to wonder whether this was a normal effort evoked in desperate attempts to hurry, and escape, or whether it was the outcome of some grievous bodily hurt, which had rendered ordinary progression impossible, this strange antic having been acquired in consequence.

It is, however, significant to note that precisely the same movement has been observed in other snakes, and what is possible for one animal seems likely to be repeated by another of similar bodily conformation. Miss Hopley in her book on snakes (p. 184) says: "The black snake of Australia (*Hoplocephalus pseudechis*) moves *in pursuit or escape* (the italics are mine, F. W.) almost like leaps. The reptile rapidly extends itself to full length, then brings up its posterior portion in a loop, and so springs forward again."

F. WALL, MAJOR, I.M.S., C.M.Z.S.

DIBRUGARH, ASSAM, 23rd *July* 1907.

No. XXVIII.—VERNACULAR NAMES OF SOME INDIAN DUCKS.

Mr. P. R. Cadell's note under the above title in our Journal (Vol. XVII, p. 1028) prompts me to add the following local names in use about Fyzabad :—

Red-crested Pochard (*Netta rufina*) ♂	Lāl sir.
Do. ♀	Maidi.
Red-headed Pochard (*Nyroca ferina*)	Tilaira.
White Eye Pochard (*Nyroca ferruginea*)	Boora.
Pintail (*Dafila acuta*)	Pashār.
Gadwall (*Chaulelasmus streperus*)	Myle.
Shoveller (*Spatula clypeata*)	Pan pan.
Brahminy duck (*Casarca rutila*)	Chakwa Chakwee.
Garganey (*Querquedula circia*)	Pataira.
Common teal (*Nettim crecca*)	
Cotton teal (*Nettopus coromandelianus*)	Dārrā and Keeun Keeun.

These names were all applied to these ducks on Parbatty Jheel. My mallah was a very knowledgeable man on the subject, and recognised each species with great accuracy during flight, and when brought to bag.

Some of these names did not tally with those in use on other Jheels, and this would imply that the names in some cases are extremely local. I believe, however, that this want of corroboration was more likely due to the incompetency of many of the mallahs to recognise the species, many being too apathetic to care, so long as the sahib got sport, and retrieved his cripples.

My mallah did not discriminate between the garganey and the teal, and seemed surprised when I pointed out the differences, which he accepted with doubt at first.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

DIBRUGARH, ASSAM, 23rd *July* 1907.

No. XXIX.—FRESHWATER SHELLS. AN APPEAL.

SIR,—It is sincerely to be hoped that Mr. Dalgliesh's interesting paper, which appears in this number, will encourage members, in *all parts of the country*, to go to the very small trouble that is required to send us along any freshwater shells they may come across, and so enable us to make a sort of "Survey" of them throughout India and its dependencies. This may seem at first sight a somewhat unnecessary proposal, but the fact is that nearly all freshwater shells are very widely distributed, and are also specially liable to considerable variation, due no doubt to the extreme variety of conditions under which they exist in different localities within their range. The result of this is that a multiplicity of specific names has from time to time been given to many shells, and this confusion can only be removed by the careful examination and comparison of specimens from all parts of the range of each species.

These remarks apply more particularly to every kind of *Limnæa* (the fragile-shelled pond snails) which can be found in almost every river, tank, pond, ditch or even puddle throughout the country, and in a less degree to the different kinds of freshwater mussels (*Unio*) and the variable, large, black species of *Melania* found in Cachar and those parts.

The material at the British Museum is not nearly extensive enough to really arrive at a solution of the questions of what should rank as recognised species, and it is only by the help of the members of such a Society as ours that material can be accumulated to enable conclusions to be drawn.

If members will send us the specimens, we will pass them on to the British Museum to be worked out. Many volumes of the series of handbooks on the "Fauna of British India" have now been published, and in the last we are informed that one on the land shells is in active preparation. Compared with the freshwater shells, the land shells, with their enormous variety of species and forms, would appear a far bigger job to tackle, but it is indicative of our ignorance of the freshwater shells that no one has been found to undertake the task of classifying and describing them.

Even if there is no general response to this appeal, as has so often been the disappointing result in similar cases, it should be borne in mind by every member throughout the country that his individual contribution will be none the less valuable, and may even be of the greatest assistance in deciding some doubtful point.

Nearly every member of the Society, even in the most desert tracts, has some bit of running or stagnant water in his immediate neighbourhood and snipe and duck shooting take many to the vicinity of jhils and moist places. I hope therefore when you do come across pond snails and river mussels, you will remember us and pop some shells into an empty match box or cartridge case, where they will be safe with a plug of grass in the end to prevent them falling out, till they can be treated with a couple of minutes in boiling water and the animal removed.

We do not want dead shells if live ones can be obtained, and the pond snail is not a lively customer that requires a lot of catching

Above all remember that the record of accurate locality is of almost equal value to the shell.

KARACHI, *2nd August* 1907. E. COMBER.

No. XXX.—NOTE ON EFFECT OF STRYCHNINE POISON ON WILD DOGS.

In the Nimar District of the Central Provinces wild dogs have been exceptionally numerous of late years, doing no end of damage to game, and so far as my experience goes, are becoming daily bolder and more fearless in their relations to human beings. An attempt is being made to reduce their numbers by arming some of the more reliable forest subordinates with Snider muskets for the destruction of these pests. In this way in the last three years an average of about 20 dogs per annum has been accounted for, but all to no purpose, for the numbers are undoubtedly increasing.

During the month of March this year the dogs began to turn their attention to buffalo "kills" tied up for tiger. In this way I lost two "kills" within a few days. It then occurred to me I might turn this new feature to good account by keeping by me a supply of strychnine poison.

I at once wrote to Messrs. Kemp & Company of Bombay and obtained a supply of strychnine. I have not tasted it myself but I have no reason to suppose it is not what it is intended to be! I did not have to wait long before a chance arose of using it. On the 18th April I had a panther kill and on the morning of the 18th, when I arrived at my camp at Chickdaria Forest Village, I was brought word that three wild dogs were on the kill. I immediately proceeded to the spot in time to see three dogs slinking off into the jungle. On examining the kill, I found the head and shoulders of a small "boda" remaining. I thereupon cut gashes about six inches long and two inches deep in the fleshy parts and inserted into these cuts 11 grs. of strychnine. I then left the kill at about 10 a.m. and did not return to it again until 5 p.m. On my return there was not a vestige of the kill remaining; it had been completely eaten up. The next thing to do was to look for dead dogs, but a close search round the kill only produced two dead vultures.

I then moved off towards a tank which contained the only available drinking water for animals for several miles around. I thought I might possibly find some dogs near the water. About ¼ mile from the 'kill' and close to the tank I was assailed by a terrible odour, and looking about came upon the fresh vomit of a dog or dogs and the next moment saw half a dozen slinking along to the tank to drink. An unsuccessful shot at one of them dispersed them.

In the end I found nothing more, and the total result of the 11 grs. of strychnine was one wild dog vomit!

The next morning a better chance came. I was about to march when a noise, which I took to be that of a bear, caused me to run off in the direction it came from, taking my rifle with me. Not one hundred yards from my camp I came across a young doe nilgai not yet dead, but already the dogs had begun their horrid meal. The sight was gruesome and I quickly despatched the groaning animal. This was an opportunity not to be missed, a perfectly fresh kill and hardly touched. While sending off for the strychnine I sat up over the kill with my wife, who was fortunate in polishing off an old dog which returned in the meantime for a meal.

It is as well to note the size of the kill, which was that of an ordinary country tat about 11 hands in height. I determined to do the work thoroughly this time. I therefore cut long deep gashes all over the body, head, neck rump, thighs,—in fact everywhere where there was plenty of flesh. This I did on both sides and into each cut I sprinkled 4 to 5 grs. of strychnine, closing up the cut again carefully. In this way I distributed 104 grs. of strychnine in 20 to 25 long deep cuts all over the animal. I then left two men in charge with strict orders to watch the kill and not allow any birds or animals to come to it until night time.

I felt sure I was going to bag the whole pack this time. The next morning I was unable to go myself, but the news was brought me that the " kill " had been eaten up, and the only thing to be found was one dead hyæna ! I could hardly believe the report ; I therefore sent my own shikari to hunt the jungle all round, and the following day I myself went to the spot. There was no doubt about the truth of the report, there was not a vestige of the nilgai to be found, not even its hoofs. The dead hyæna was within 10 yards of the spot and two or three vultures, but nothing else. The jungle for half a mile round was searched, but not a dead dog was to be found though their vomit was come across.

If those who have waded through this long story so far can explain this phenomenon I shall be extremely grateful. Obviously the hyæna could not have eaten up the whole nilgai. What happened to the dogs ? Did they go off and die in holes far away ? Or are they immune to poison? Is it possible to give too much poison, if so what is the correct amount ? I cannot find the answer to this riddle. I throw out a suggestion, not my own—do the survivors carry off their dead and bury them ? This is not such an idle question as it may seem. A sportsman shooting in this district this year compared notes with me and told me that he had also tried poison, strychnine and arsenic, and had seen one young dog die, whereupon its mother appeared and tried to drag it away.

If this story serves to elicit replies from other sportsmen, with proved methods of using poison to exterminate wild dogs, the present failures will not have been altogether in vain. The matter is an important one in the interest of sport. I may add that the dogs in this district are becoming so fearless that only this last month a Forest Guard was able to kill one with an axe. The brute with several others was actually coming to attack him.

D. O. WITT,

KHANDWA, 2'*nd June* 1907. Dy. Conservator of Forests.

[The above was published in the *Indian Forester* for July 1907, Vol. XXXIII, No. 7.—EDS.]

PROCEEDINGS

OF THE MEETING HELD ON 25TH OF JULY 1907.

A meeting of the members of the Bombay Natural History Society took place at the Society's rooms on 25th July 1907, Rev. F. Dreckmann presiding.

The election of the following 28 new members since the last meeting was duly announced :—

Capt. C. C. Murison, I.M.S. (Sukkur, Sind); Mr. Evan Evans (Dibrugarh, Assam); Lt.-Col. W. A. Watson, C.I.E. (Agar, C.I.); Mr. H. J. Hoare, I.C.S. (Indore, C.I.); Mr. G. B. F. Muir, I.C.S. (Fatehgarh, U.P.); Major C. Archer, C.I.E. (Quetta); Rev. Mr. Duncan Dixey, C.M.S. (Quetta); Mr. H. C. H. Cooper (Quetta); Mr. T. Char (Quetta); Mr. G. Frost (Quetta); Rev. Mr F. Lawrence, C.M.S. (Quetta); Khan Saheb Ardeshir D. Market (Quetta); Khan Bahadur Burjorji D. Patel (Quetta); Mr. W. R. S. Porter (Quetta); Bhai Sadhu Sing (Quetta); Major F. C. Webb Ware, C.I.E. (Quetta); Major A. McConaghey (Quetta); Mr. J. A. C. Kiddle (Hminelongyee, Papan, Burma); Mr. D. N. Wadia, M.A. (Kashmir); Mr. Stephen Cornelius (Mahim, Bombay); Mr. G. C. Howell, I.C.S. (Nagar Kulu, Punjab); Mr. S. V. Shevade B.Sc. Pusa, Bengal); Mr. R. C. H. Moss King, I.C.S. (Saugor, C.P.); Mr. R. J. Angus (Calcutta); Mr. C. C. Inglis (Mirpurkhas, Sind); Col. P. M. Ellis, R.A.M.C. (Quetta); and Lieut.-Col. T. J. O'Donnell, D.S.O., R.A.M.C (Quetta).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary acknowledged receipt of the following :—

Contribution.	Description.	Locality.	Contributor.
Eggs of	*Coturnix communis.*	Punjab	Mr. S. M. Morris.
	Halcyon smyrnensis.	Do.	Do.
	Scops bakkamœna.	Do.	Do.
	Dicrurus ater.	Do.	Do.
2 Skins & skulls of Wild Dogs ♀ ♂	*Cyon dukhunensis*	Jalawar, Rajputana.	Capt. L. S Fenton.
2 Skins & skulls of Wild Dogs.	*Cyon dukhunensis*	Mandla, C.P.	Mr. H. F. Bell, I.C.S.
A pair of Hume's Bush Quail.	*Microperdix manipurensis.*	Gauripur, Assam.	Mr. A. M. Primrose.
1 Corncrake	*Crex pratensis* ...	Khor Musa, Persian Gulf.	Maj. P. Z. Cox.
1 Spotted Crake	*Porzana maruetta*	Do.	Do.
Some Rats	...	Konkan	Rev J. H. Lord.
1 Snake	*Gongylophis conicus.*	Bombay	Col. W. B. Bannerman, I M.S.
1 Snake (juv)	*Vipera russellii.*	Kotagiri	Mr. A. M. Kinloch.
2 Snakes	*Contia angusticeps.*	Malakhand	Sir A. H. McMahon.
2 Eggs of the Himalayan Snow Cock.	*Tetraogallus himalayensis.*	Gilgit	Do.
1 Crocodile (juv)	*Crocodilus palustris.*	Cochin	Mr. G. M. Wise.
2 Snakes	......	Tuticorin	Mr. C. E Rhenius.
Skin of a Snake	*Zamenis diadema.*	Palanpur	Col. G. Hyde Cates.
2 Skins of Yarkand Cat.	*Felis shawiana* ...	Kulu, Punjab	Genl. W. Osborn.
5 Bats	*Pipistrellus abramus.*	Gauripur, Assam	Mr. A. M. Primrose.

Minor contributions from Mr. T. H. Moore, Mr. C. E. C. Fischer, Mr. K. B. Williamson, Mr. E. C. B. Acworth, Mr. R. P. W. Strong, Mr. S. D. Smith and Mr. C. Gilbert.

CONTRIBUTIONS TO THE LIBRARY.

Cattle of the Bombay Presidency, by Major F. Joslen, C.V D. From the Agricultural Department.

Fauna of British India Series, Butterflies, Vol. II, by Col. Bingham. From the Author.

The Kingdom of Man, by Professor Ray Lankester, F.R.S. From Mr. W. S. Millard

Records of the Botanical Survey of India, Vol. III, No. 3. From Botanical Department.

First Report of the Fruit Experiments at Pusa. From the Agricultural Department.

The Calcutta Medical Journal, Vol. I, No. XII. From the Editor.

Mollusca of the Persian Gulf, Gulf of Oman and the Arabian Sea, by J. C. Melvill. From the Author.

Seventh Annual Report of the Agricultural Chemist, Mysore. From the Department of Agriculture, Mysore.

Memoirs of the Department of Agriculture in India, Entomological Series:—

Indian surface caterpillars of the genus *Agrotis*, by H. Maxwell Lefroy, Vol. I, No. 3.

Individual and seasonal variations in *Helopeltis theivora*, Waterhouse, with descriptions of a new species of *Helopeltis*, by Harold H. Mann, Vol. 1, No. 4.

The Agricultural Journal of India, Vol. II, Part II.

A note on the Duke Fig-tree Borer in Baluchistan, by E. P. Stebbing.

The Indian Forester, Vol. XXXIII, Nos. 4 and 6.

Journal of the Agri-Horticultural Society of Western India from October 1906 to March 1907.

Annals of the Royal Botanic Garden, Calcutta, Vol. IX, Part II.

Kindly presented to complete our series:

Journal and Proceedings of the Asiatic Society of Bengal, Vol. II, Nos. 9 and 10, and Vol. III, Nos. 1, 2 and 3.

Memoirs of the Asiatic Society of Bengal, Vol. II, No. 1, Cirrhpipedes Opercules de L'Indian Museum de Calcutta.

Zoological Gardens Cairo, report for the year 1906.

Kindly presented by the Geological Survey of India to complete our series:—

Memoirs, Geological Survey of India, Vol. VI, Parts 3; Vol. VII, Parts 1, 2 and 3; Vol. VIII, Parts 1 and 2; Vol. IX, Parts 1 and 2; Vol. X, Parts 1 and 2; Vol. XI, Parts 1 and 2; Vol. XII, Parts 1 and 2; Vol. XIII, Parts 1 and 2; Vol. XIV; Vol. XV, Parts 1 and 2; Vol. XVI, Parts 1, 2 and 3; Vol. XVII, Parts 1 and 2; Vol. XVIII, Parts 1 and 3; Vol. XIX, Parts 1, 2 and 3 and Vol. XXII

Palæontologia Indica: Series I, III, V, VI, VIII,—Cretaceous Fauna of Southern India; Series II, XI, XII,—The fossil Indian Pre-Tertiary Vertebrate Flora of the Gondwana System, Series IV, Vol. I; Series VII, XIV, Tertiary and Upper Cretaceous Fauna of Western India; Series XIII, Vol. I, Salt Range Fossils, and Series X.

LOSSES TO THE SOCIETY.

The Rev. F. Dreckmann referred to the loss which the Society had experienced through the departure from Bombay of Mr. Comber, the Honorary Secretary for the Birds and Mammals Section, and who had been in charge of our Collection of Shells; and of Mr L. C. H. Young, who had for several years been in charge of the Entomological Collections, which he had arranged and classified on a scientific basis.

Mr. Comber was still in India and able to help us with his advice, and the speaker hoped that Mr. Young. who had left India in bad health, would speedily recover and be able to continue the interesting series of papers he had been writing for the Journal on the Common Butterflies of the Plains of India.

The loss of two such men to a Society dependent on honorary labour was a serious blow, but he was happy to be able to state that owing to the generosity of the Bombay Government, the Society was now in a position to secure the services of a curator, who would be a trained naturalist. Great pains were being taken to obtain a suitable man and he was glad to say that Mr. Millard had found the right kind of man at home, and that he hoped to hear in a week or two that the Society's offer had been accepted. Should this be the case, the new curator would spend two or three months at the Natural History Museum, South Kensington, and arrive here at the end of November.

THE RETIRING PRESIDENT.

Mr. James Macdonald proposed that a vote of thanks should be passed to H. E. Lord Lamington, their retiring President, and also an expression of their sympathy and great regret at the reason which had compelled His Excellency to leave India so soon, and their hope that Lady Lamington's health would be speedily restored.

In the course of his remarks Mr. Macdonald pointed out that Lord Lamington, who had been their President since January 1904, had shown his interest in the Society and in Natural History in general in many ways. He had presided at one of their meetings, and the fine Ghavial head on the table had been presented by Lord Lamington who had shot it in Sind.

It was during Lord Lamington's Governorship that the Society had received from the Bombay Government the promise of an additional grant of Rs. 2,500 per annum which would enable the Society to obtain the services of the trained curator of whom Father Dreckmann had spoken.

The new Public Museum for Bombay owed its inception to His Excellency, and the speaker hoped that Lord Lamington would at some future date revisit India and see the Museum completed and in vigorous life.

Col. Bannerman said he had much pleasure in seconding the motion and endorsing what Mr. Macdonald had said.

The motion was then put to the meeting and carried unanimously.

BALUCHISTAN NATURAL HISTORY SOCIETY.

The Honorary Secretary said he was glad to be able to record the foundation in Quetta of a Natural History Society, the members of which were interesting themselves in the fauna and flora of Baluchistan, a region in which there was great scope for such study, owing to its geographical situation, and the fact that up to now no systematic study had been made of its Natural History. The new Society owed its foundation to the energy of Sir Henry McMahon, and would be practically a branch of our Society, as the majority of the members either were or would become members of the Bombay Natural History Society, and we should publish in our Journal the results of their labour.

PAPERS READ.

The following papers were then read and discussed :—

1. Notes on a trip after "*Ovis poli*," by Col. Sulivan.
2. Two new Snakes from Assam, by Major F. Wall, I.M.S., C.M.Z.S.
3. On a new genus and some new species of Aculeate Hymenoptera, by P. Cameron.
4. Some notes on Wild Dogs and Panthers, by Lt.-Col. F. W. Caton Jones, R.A M.C.
5. The effect of strychnine poison on Wild Dogs, by D. O. Witt, I.F.S.
6. A visit to the South Sentinel Island, by B. B. Osmaston, I.F.S.
7. Indian Freshwater Shells, by Gordon Dalgliesh.
8. Notes on Snakes collected in Fyzabad,:by Major F. Wall, I.M.S., C.M.Z S.
9. Breeding of snakes in captivity, by Col. W. B. Bannerman, I.M.S.

PROCEEDINGS

OF THE MEETING HELD ON 5TH SEPTEMBER 1907.

A meeting of the members of the Bombay Natural History Society took place at the Society's Rooms on 5th September 1907, Mr. James Macdonald presiding.

The election of the following 17 new members since the last meeting was duly announced :—

Lt.-Col. R. P. Colomb (Buldana); Khan Bahadur Nawab Mahomed Salamullah Khan (Buldana); Major R. C. Macwatt, I.M S. (Jodhpur); Mr. H. L. Kemball (Mount Abu); Mr J. C. Faunthorpe, I.C.S. (Kheri); Mr. E. A. Courthope, I.F S. (Dehra Dun); Mr. A. de C. Rennick (Nagpore, C. P.); Mr. J. W. Lonsdale (Madras); Mr. G. R. Webb (Parel, Bombay); Capt. E. B. Fredericks (Secunderabad, Deccan); The Principal, Berhampur College, Berhampur (Bengal); Mr. A. G. Ronald (Madras); Capt. R. B. Skinner, R. E. (Peshawar); Mr. C. C. D'Albedyhll (Hyderabad, Sind); Mr. J. H. McNeale, (Seoni, C. P.) ; Mr. B. S. Carter (Bombay); Mr. E. B. Gordon (Fort William, Calcutta).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary acknowledged receipt of the following :—

Contribution.	Description.	Locality.	Contributor.
1 Snake	*Tropidonotus stolatus.*	Berhampur, Bengal.	Major C. J. Robertson Milne, I.M.S.
1 Skin of Himalayan Weasel.	*Putorius subhemachalanus*	Nagar, Kulu, Punjab.	Genl. W. Osborn.
1 Skin of Common Iora.	*Ægithina tiphia.*	Poona.	Mr. P. Hide.
1 Common Rock Lizard.	*Agama tuberculata.*	Kasauli, Punjab..	Colonel F. W. Thomson.
1 Skin and skull of a mouse.			Captain H. W. Long.
Cockoons	*Caligula simla...*	Dehra Dun	Mr. O. C. Ollenbach.
2 Common Pit-Vipers...	*Lachesis gramineus.*	Karla	Mr. P. Gerhardt.
1 Wolf's skull	*Canis pallipes* ...	Fatehgarh, U. P..	Major J. G. Hulbert.
1 Snake (alive)............	*Dryophis mycterizans.*	Dharwar	Mr. C. W. Hudson, I.C.S.
2 Skulls of Himalayan Black Bear. ♂ ♀	*Ursus torquatus.*	Bhadarwa, Jammu State.	Mr. C. H. Donald.
2 Skulls of Indian Marten	*Mustella flavigula.*	Do. ...	Do.
1 Skin of the White-necked Spine-tail.	*Chætura nudipes.*	Do. ...	Do.
1 Skin of the Booted Eagle.	*Hieraetus pennatus.*	Do. ...	Do.
2 Owls	......	Do. ...	Do.

CONTRIBUTIONS TO THE LIBRARY.

Administration Report of the Royal Botanic Gardens, Ceylon.—From the Director.

Memoirs of the Department of Agriculture in India. "The more important Insects injurious to Indian Agriculture," by H. Maxwell Lefroy.

Memoirs of the Department of Agriculture in India. Entomological Series—The Coccidæ attacking the Tea Plants in India and Ceylon.

Chemical Series—Experiments on the Availability of Phosphates and Potash in Soils.

Allen's Naturalists' Library—Game Birds, Vol. I & II., by Ogilvie-Grant.—From Mr. W. S. Millard.

Bulletin de la Societe Royale de Botanique de Belgique for 1906.

Annual Report of the Board of Regents of the Smithsonian Institution for 1905.

Transactions of the Academy of Science of St. Louis, Vol. XV, No. 6, and Vol. XVI, Nos 1 to 7.

Vierteljahrsschrift der Naturforschenden Gesellschaft in Zurich.

A LOSS TO THE SOCIETY.

The Rev. F. Dreckmann stated that at the last meeting he had had to refer the loss the Society had suffered through the departure from Bombay of the President of the Society, and Messrs. Comber and Young. He now wished to refer to the grievous loss which not only the Society but all lovers of Nature in India had suffered through the departure home in May last of Mr. E. H. Aitken.

Mr. Aitken was one of the six founders of the Society and was its first Honorary Secretary, working indefatigably as such from September 1883 until March 1886, when he relinquished the post on his being transferred from Bombay. Mr. Aitken was also, with the late Mr. R. A. Sterndale, the first Editor of our Journal, the first number of which was produced in January, 1886.

Mr. Aitken's work on Natural History and, he might add the study of man, witness "Behind the Bungalow," written over the initials E. H. A., were well known to all and must have been the means of first instilling into many a love of the study of nature.

His contributions to the Society's Journal had been many and varied, as a glance at the General Index to our Journal would show; but, as was said of the late Mr. Sterndale at a former Meeting, this gives no idea of the extent to which the Society is indebted to him. His writings show us, however, what manner of man he is—a lover and student of nature and not merely a Museum Naturalist.

Mr. Aitken was Secretary of the Insect Section from the foundation of the Society until the death of Mr. De Niceville, when he became the President of the Section. He was elected a Vice-President of the Society in July, 1902.

Although absent from India the speaker was sure Mr. Aitken's interest in the Society would not cease. In the next number of the Journal there would appear a note by Mr. Aitken written by him in the Red Sea on his journey home.

In conclusion he proposed that the Hon. Secretary should write to Mr. Aitken conveying the regret of the members of the Society at his departure, their thanks for all he had done, and their wish that he would long enjoy good health at home.

Mr. James Macdonald, in seconding the motion, mentioned that it was whilst Mr. Aitken was living in his house that the idea of forming the Natural History Society was discussed and carried into effect by Mr. Aitken, his brother Dr. Macdonald, and four other gentlemen, none of whom were now in India.

The motion was carried with acclamation.

PAPERS READ.

The following papers were then read:—

1. Statistical Notes on the Flora of the Bombay Presidency by Rev. E. Blatter, S. J.; 2. Shot-borers in Bamboos, by E. P. Stebbing, I.F.S., F.E.S., F.Z.S.; 3. A Visit to Barren Island in the Andamans, by B B. Osmaston, I.F.S.; 4. Keenness of sight in Birds and Animals, by C. H. Donald.; 5. Remarks upon the Snake *Contia angusticeps*, by Major F. Wall, I.M.S.; 6. The Breeding Habits of Snakes and Lizards, by Rev. F. Dreckmann, S. J.

A vote of thanks to the authors of the papers terminated the meeting.

REPORT OF THE FIRST TWO MEETINGS OF THE BALUCHISTAN NATURAL HISTORY SOCIETY, QUETTA.

The invitation issued by the Hon'ble Major Sir Henry McMahon, to such of the Officers in the station as were interested in Zoology and Botany to meet him in the Library and Museum building on the afternoon of the 10th June, was responded to by a large number of gentlemen.

A visit was first paid to the portion of the building allotted to the Museum and, doubtless to the surprise of many, it was found to contain some exceedingly valuable and interesting exhibits which formed a fair show considering the short space of time that had elapsed since the building was opened. It might interest some of the public to know that the Museum is already in possession of numerous specimens of arts and manufacture, agricultural implements, models of boats and fishing tackle, &c., from Ormara, and ancient pottery and coins collected in the country by Mr. Hughes Buller and other members of the Gazetteer Office; a large and valuable collection of minerals, properly classified and labelled, presented by Colonel J. Day for the special object of inducing the local public to take up the study of mineralogy; a fine collection of sea shells presented by Colonel W. St. L. Chase, V.C., C.B., himself a member of the Museum Committee; a large collection presented by Mr. J. W. N. Cumming of the eggs of birds, most of which, if not residents of the Province, are regular visitors to some part of the enormous area of which it is composed; a small collection of local botanical specimens contributed by the Baluchistan Forest Department; a very good collection indeed of works on Natural History received by donation from Sir Henry McMahon and Colonel C. E. Yate or by transfer from the offices of the Hon'ble the Agent to the Governor-General and the Superintendent of District Gazetteers, and some few butterflies and snakes, fossils, pottery, coins, &c., collected in the country either by members of the Museum or others interested in it.

So that it was not surprising if a little time elapsed before the business of the evening could be entered upon, for which purpose all present were invited into the Library where there was ample seating accommodation. Here the Hon'ble Sir Henry McMahon, after thanking the gentlemen for responding so encouragingly to his invitation, explained briefly the object of the meeting. The substance of his address was :—

That there were many in Quetta interested in Zoology and Botany, some possessing a wide knowledge, others expert specialists in certain particular branches, while others again were anxious and willing to assist if only shown the way. Sir Henry's primary object was to find out who we have in Quetta of the above classes and to give them an opportunity of meeting and knowing each other as such, as much disappointment had been experienced by many in the past owing to different experts having worked in, and again left the country, each ignorant of the existence of others of similar tastes whose assistance they would have been only too glad to avail themselves of. Sir Henry pointed out that Baluchistan afforded an immense field for research in Zoology and Botany, the area being immense, the workers being few, and large tracts quite untouched. He said that there was no province in the world under any civilised Government where there was so much work for specialists and which offered so many opportunities for valuable assistance from amateurs Collectors can do valuable service to science and be encouraged by the prospect of discovering new and rare finds. Quoting his own case as an instance, Sir Henry stated that he had more snakes, lizards, scorpions, spiders, beetles and plants of Baluchistan named after him than fell to the lot of most amateurs in other countries. Sir Henry pointed out that there was no need to travel far or wide, as there were rare fauna and flora to be found on the Quetta Gymkhana grounds and even in our own gardens. offering great scope for interesting research. To give an idea of what might be collected by amateurs and others, he stated that he had received numerous letters from specialists asking for butterflies, white ants and earthworms; appeals from the Natural History Museum in London for mice, rats, moles from Baluchistan, which were considered rare and unknown, and piteous appeals for bugs! So that there was nothing too small or uncommon to collect, but on the other hand a great deal of pleasure to be derived in life by the study of animal and vegetable life around us.

Sir Henry further stated that his object was not merely to arouse an interest in the study of Zoology and Botany in general but in that of Baluchistan in particular, and urged more united and systematic research and a determined effort to collect specimens of every sort, and thus ascertain all we can of the fauna and flora of the Province. Government having placed at our disposal a Museum building, Sir Henry stated that the collections to be placed in it should be confined to Baluchistan, and that all Zoological and Botanical collections would be gratefully received on two conditions, *viz.*, that the locality be given on each, and that all must come from Baluchistan. Lastly, with a view to entering upon a thorough and systematic study of the flora and fauna of the country, Sir Henry considered the best thing to be done was to—

(1) institute a Baluchistan Natural History Society;
(2) make out a list of all wishing to join;
(3) ascertain those among them who were experts in any particular branch and make use of their knowledge by sending to them, for identification and classification, specimens collected;
(4) direct the attention of others willing to assist, however amateur they may be, to the objects to be collected and the method of going about it;
(5) send elsewhere specimens which cannot be classified by local experts;
(6) make good use of the conveniences provided by the Museum, such as a trained taxidermist, books of reference, etc., and lastly to
(7) encourage others to join the Society.

In this connection Sir Henry stated that there would be no call on the members of the local Society for subscriptions, as their contributions in the way of specimens would be sufficient, and suggested, as a simple expedient for meeting the cost of classification and publication of collections, that such of the members who could afford to do so might also join the Bombay Natural History Society, the cost of which per member would be an entrance fee of Rs. 10 and an annual subscription of Rs. 15, in return for which each member would receive three or four times in the year a copy of their beautifully illustrated and well got-up journal. The benefit of this, Sir Henry said, would be mutual, for while the Bombay Natural History Society would welcome any contributions we may send them and benefit by our collections and subscriptions, we would also benefit by the assistance they would give us in identifying and classifying specimens and in publishing the results of our researches. The Baluchistan Natural History Society would thus become, so to speak, a branch of the Bombay Natural History Society.

Sir Henry then asked for the names of those who would be willing to join both Societies and actively assist the same, adding that he had only alluded to Zoology and Botany, but that Geological, Archæological and other collections locally made would also be gratefully received.

All present agreed to become members of the Baluchistan Natural History Society, and several of them expressed their desire to also join the Bombay Society. Sir Henry then proposed that a President and Honorary Secretary be elected for the local Society, the formation of a Committee being left to another meeting. This was agreed to, and Sir Henry himself was unanimously elected the President and Mr. Cumming, the Honorary Secretary.

This done, it was agreed to hold the next meeting in the same place on Friday, the 28th June, at 3-30 p. m.

The meeting then broke up.

The attendance at the second meeting on 28th June was very encouraging.

After a visit to the museum rooms, where a fairly large number of newly contributed Zoological and Botanical specimens, mostly donated by members, were found laid out, all present adjourned for business to the Library room. On all being seated, Sir Henry McMahon addressed the meeting as follows :—

"I am delighted to see so many here to day. The number who responded to my invitation to our first meeting and the number here to-day encourage me to think that Natural History research in Baluchistan is going to make a really good start.

For the benefit of those here to-day who were not present at our first meeting—and I am glad to see many of those—I may state that at that meeting we constituted ourselves the Baluchistan Natural History Society for the purpose of Zoological and Botanical Research in Baluchistan. Our object, ambitious though it may seem, is to study the fauna and flora of this large province, to ascertain and classify all the animal and vegetable life we have in this country.

I propose to say a few words more to-day in explanation of that object. Some may not quite have understood why I laid such stress on our collecting and storing in this museum only specimens obtained in Baluchistan. Remember I am at this moment only talking of Zoology and Botany. My first reason for this is that our Museum is only a small building, and if we take to storing in it elephants and alligators and such like creatures of other countries, we shall soon be crowded out. My chief and important reason, however, is the desire to collect and display in this building a comprehensive collection of the flora and fauna of our own province, Baluchistan, so as to show what that province possesses, what can be found in it, and where ; and above all to show by such a collection how our flora and fauna differs from that of other provinces or differs, in Baluchistan itself, between one district and another.

Since I spoke on this subject at our last meeting, I happened to read a passage in the great Dr Wallace's valuable book, "The Geographical Distribution of Animals" which itself explains the importance of the object I have advocated. He writes (p. 552 of Vol. II) : 'At present all public museums and private collections are arranged zoologically. All treatises and catalogues also follow, more or less completely, the zoological arrangement, and the greatest difficulty the student of geographical distribution has to contend against is the total absence of geographical collections and the almost total want of complete ° ° ° local catalogues. Till every well-marked district ° ° ° has all its known species of the more important groups of animals catalogued on a uniform plan ° ° ° a thoroughly satisfactory account of the geographical distribution of animals will not be possible.'

What Dr. Wallace has said of Zoology applies equally to Botany.

I will not bother you with a scientific discourse, but I could speak for hours on the importance of the study of the geographical distribution of plants and animals It teaches us a great deal about the past history of this earth. It is full of the most interesting problems, which have never yet been solved.

We can help science very greatly by carrying out the object of this Society, *i.e.*, studying and recording the geographical distribution of the fauna and flora of Baluchistan.

Now Baluchistan is a large country ; it comprises many tracts or regions widely differing in various ways from each other. We have the hot lowlying plains of Kachi the high cold plateau of Kalat, Kakar-Khorasan and Toba, the sand deserts of Registan and Chagai, and mountain ranges covered more or less with forest growth. Each of these regions differ in soil, temperature and climate, and each has many animals and plants which are not to be found in the other regions.

I hope soon to prepare for the use of this Society a map of Baluchistan, showing its various geographical districts or regions.

When we come to put together our collections, grouping them separately according to the regions from which they come, we shall find that the animals and plants of each tract have many characteristics of colour and form common to each other, but differing from the characteristics of collections from other regions.

On seeing the variations of colour and form between the specimens of one region and another, the first question that comes to everyone's mind is, what is the cause of these variations? Is it due to different soil, temperature, or what? I assure you there is nothing so interesting as puzzling out such problems for ourselves. They are not useless problems, but of scientific value. As Dr. Wallace writes in the concluding passage of his book, which I have already quoted, 'They constitute a mine of wealth for the enterprising worker, and they may not improbably lead to the discovery of some of the hidden laws which seem to be required in order to account for many of the external characteristics of animals,' and, I may add, plants.

Now this is why I advocate our working at the Natural History of Baluchistan on geographical lines. Let us work out the geographical distribution of the animals and plants of Baluchistan as a whole and of those of each geographical region of Baluchistan separately.

That, again, is why I impress on you to be careful, in your collections and in your lists, to record exactly where each thing is found.

This work is one that will suit us better than more scientific Zoological and Botanical work, because it can be done, and important results can be obtained in so doing by amateurs.

All can help Those who cannot make big collections can make small ones, or can make lists, which, however, should be accurate, of what they have seen at various places, or send us brief notes on any one particular thing they see or notice."

Sir Henry here expressed regret that certain visitors to Baluchistan, whose names he left unmentioned, had made collections of beetles, etc., in the country and sent them all away without leaving any duplicates for the Museum. He, however, expressed the hope of securing lists of these collections, if not some of their duplicates.

Sir Henry then mentioned, as matters full of interest, some of the minor problems which present themselves to those who engage in the study of Zoology and Botany, *viz* :—

(1) The dividing line in Baluchistan between the Indian and European wolf.
„ „ „ fox.
„ „ „ hare.
„ „ Indian and Persian Gazelle.

(2) Is the Euphratic viper, found in Ziarat, to be found between Ziarat and Persia?

(3) Why are most of our Baluchistan wild flowers yellow? There must be some reason for this, just as there must be for the fact that flowers at high altitudes are mostly blue?

(4) Why have so many of our plants such a strong pungent smell, and why are so few sweet scented?

Captain Roosmalcocq suggested that steps should be taken to include duck among the game birds, for the protection of which a "close season" had been declared by the Local Government, as he had found the mallard breeding at the Khushdil Khan Lake; and Sir Henry agreeing, promised to arrange accordingly.

The following were then elected:—

(1) As Vice-Presidents of the Baluchistan Natural History Society:—
Colonel P. M. Ellis, R.A.M.C.;
Col. W. St. L. Chase, V.C., C.B.; and

(2) As a Committee for classification:—

BOTANY.

Colonel P. M. Ellis, R.A.M.C.
Bhai Sadhu Singh.
Mr. A. Anderson.
Mr. W. R. S. Porter.
Mr. G. Frost.

ZOOLOGY.

Beetles and Insects.

Captain R. Selous.

Birds.

Revd. F. Lawrence.
Mr. J. W. N. Cumming.

Conchology.

Colonel W. St. L. Chase, V.C., C.B.

Mammals.

Sir Henry McMahon, K.C.I.E., C.S.I.
Revd. F. Lawrence.

Reptiles.

Sir Henry McMahon, K.C.I.E., C.S.I.

It was also decided that a meeting of the Baluchistan Natural History Society be held regularly on the last Thursday of every month at 3-30 p.m.

With this the meeting came to a close.

THE SHELDRAKE.

NOTICE.

THE SHELDRAKE (*TADORNA CORNUTA*).

The accompanying coloured plate (No. XXVI) of The Sheldrake (*Tadorna cornuta*) is in continuation of the series of plates already published in this Journal in connection with the paper on "*Indian Ducks and their Allies*" by Mr. E. C. Stuart Baker.

The description of the Sheldrake now figured will be found at pages 571 to 575 of Vol. XI. of this Journal.

Four more plates have to appear in the Journal to complete this series and they will be—

No. XXVII. The White-winged Wood Duck (*Asarcornis scutulata*).
,, XXVIII. The Pink-headed Duck (*Rhodonessa caryophyllacea*).
,, XXIX. The Lesser or Common Whistling Teal (*Dendrocygna javanica*).
,, XXX. The Smew (*Mergus albellus*).

EDITORS.

JOURNAL

OF THE

BOMBAY

Natural History Society.

Vol. XVIII. BOMBAY. No. 2.

A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATES AND DIAGRAMS.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

Part VI., with Plate VI., Diagram and Map.

(Continued from page 17 *of this Volume.)*

THE GOLDEN TREE-SNAKE (*Chrysopelea ornata*).

Nomenclature.—Scientific.—The generic name is from the Greek *chrysos* gold, and *peleios* black. The specific is from the Latin *ornatus* adorned.

English.—The golden tree-snake or the gold and black tree-snake.

Vernacular.—" Kalla Jin " the name given by Russell for a specimen probably obtained in Bengal, is probably Urdu implying " black saddles " with reference to the black cross bars. Its name in Ceylon according to Ferguson is " pol mal karawala."

Dimensions.—The largest specimen I know of is the one obtained by Evans and me in Rangoon, which taped 4 feet 5½ inches. Specimens over 4 feet are unusual.

Physiognomy and bodily configuration.—The snout is broad, blunt, and rounded, the head flattened and the neck moderately constricted. A moderately well developed eye with golden iris (Cantor says black) gives a vivacious expression to a not unpleasing countenance. The pupil is round. The nostril is moderate in size, and placed entirely or almost entirely in the anterior nasal shield. The body though rather slender is far less so than in other tree snakes, notably *Dendrophis*, *Dendrelaphis* and *Dryophis*. It is rather depressed. The belly is peculiar in the ridges on the lateral aspect of the ventral shields. The tail is long, and tapers very gradually. It is about one-fourth the total body length and it is ridged beneath on either side similarly to the belly.

Colour.—Mr. Boulenger* divides this species into eight colour varieties, many of which I have not seen. I quote therefore from him, supplementing the habitats he records, from my notes, and other sources. Many of the references of other authors, however, to this snake make it impossible to refer the specimen to any of these varieties, for want of precise information regarding the colour.

" *A.*—Black above, each scale with a round greenish-yellow spot; usually with larger coral-red spots on the back, resembling a series of tetrapetalous flowers; ventrals greenish-yellow, edged with black."

South India (Anamallays), Malay Peninsula, Malay Archipelago (Sumatra, Borneo).

Stoliczka† mentions this as common at Penang, and Flower‡ alludes to it from Penang and Singapore. Annandale§ records it from Narcondam Island.

" *B.*—Like the preceding, but ventrals not black edged."

S. India (Malabar), Malay Archipelago (Java, Sooloos, Philippines).

I examined one in the Siccawei Museum, Shanghai, from the Yangtse Valley, S. China.

" *C.*—Like the preceding, but vertebral spots confluent into a stripe, at least on the anterior part of the body."

Borneo.

" *D.*—Greenish-yellow or pale green above, each scale edged, and mesially streaked with black, with more or less distinct black cross-bars; ventrals yellow, with a small black spot on each side."

S. India (Anamallays), Burma, Assam, Siam, Lao Mountains.

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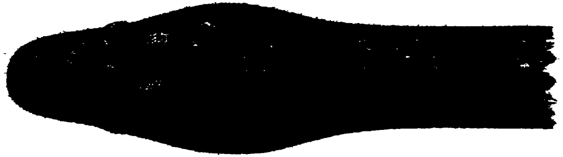
* Catalogue, Brit. Mus., Vol. III, 1896, p. 197.

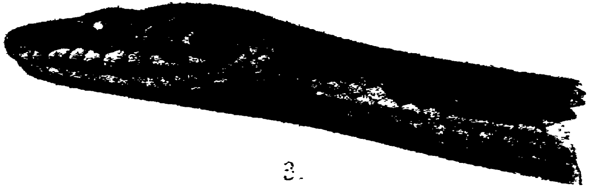
† Jourl. Asiat. Soc. Bengal, Vol. XXXIX, p. 194.

‡ Proc. Zool. Soc. Lond., 1899, p. 682.

§ Jourl. As. Soc. Bengal, 1905, p. 176.

Plate VI





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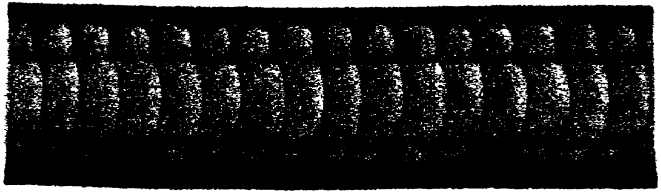

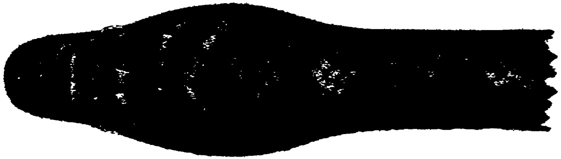

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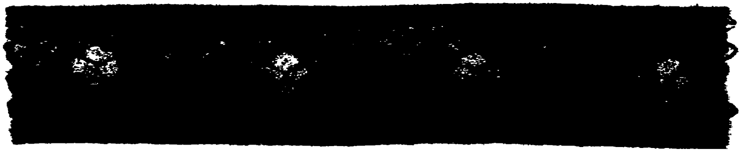

J. G. del.

Flower mentions it as fairly abundant in Siam and records it as far south as Kedah in the Malay Peninsula, where he says it is replaced by variety *A*.

" *E.*—Like the preceding, but with a series of large coral-red, or orange blotches along the back."

Ceylon, Bengal.

The plate in Russell's work is evidently this colour variety. Evans and I met with this in Burma, but it is decidedly scarcer than type *D*, which is the common one in that Province. The orange spots are not nearly so brilliant as I have seen in Ceylon specimens.

Figures 1, 2, 3 and 4 are taken from a good example from Kulhatty. (Nilgiri Hill).*

" *F.*—Pale olive above, with regular black cross-bars; some of the black scales with yellow shafts; whitish olive beneath, with a small black spot on the side of each ventral."

Ceylon.

" *G.*—Black above, with narrow yellowish cross-bars: whitish olive beneath, with a small black spot on each side of each ventral."

Philippines.

" *H.*—Olive above, with the markings much effaced; pale yellowish beneath."

Celebes, Philippines.

To these I would add another—

I.—Similar to variety *E*, but differing in the vertebral spots being yellow instead of red, and in the absence of cross-bars.

This variety is figured in our plate figs. 5 and 6. The specimen was captured at Barisal in the Gangetic Delta, and is in our Society's collection in Bombay.

Identification.—This is an easy matter if attention be directed to scale characters.

The ridged (keeled) condition of the ventral shields taken with a vertebral row of scales in no way different from its adjacent rows, establishes the diagnosis. The ridged character of the ventral shields demands some qualifying remarks. It must be impressed upon the student that the keels in *Chrysopelea* are *sharp and pronounced,*

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* Figure 4 is represented unduly broad in order to show the whole breadth of the ventrals with their keels; these latter however are not made conspicuous enough. The outline drawing shows them better.

with a minute notch on the free edge of the ventral corresponding to the keel.

This character of keel is only seen in two other genera, *viz.*, *Dendrophis* and *Dendrelaphis*, both of which are tree snakes also. In both these genera however the vertebral row of scales is enlarged, and hexagonal as in the kraits (*Bungarus*). It is to be noted that several other snakes have what may be called false keels on their ventrals, that is, the ventrals are laterally angulated. False keels are rather rounded (obtuse), and have no notch at the free edge of the ventral. The outlines in section may be compared roughly to those of a punt, and a dinghy (see Diagram I, fig. 1, A and B).

It is interesting to note that these false keels are to be seen chiefly in those snakes which manifest a climbing habit. For instance, in the genus *Lycodon*, witness the species *aulicus.* In the genus *Zamenis*, observe the ventrals in *mucosus.* In the genus *Coluber* are notably the arboreal species *prasinus*, *frenatus*, and *oxycephalus.*

In some other snakes however not conspicuous climbers the same may be seen, as for instance, many of the genus *Simotes.* In addition obtuse ventral keels are to be seen in the water snake *Hipistes hydrinus.* In McMahon's viper (*Eristocophis mcmahoni*) the ventrals are rather acutely keeled, but there is no enlargement of the vertebral row.

The only snake I know at all like *Chrysopelea* is Jerdon's pit viper (*Lachesis jerdonii*). In this the colouration is very similar, but any resemblance between these two snakes ends here. They are substantially different in almost every scale character. We do not give a plate of Jerdon's viper owing to its rarity, and restricted Indian distribution, viz: Khasya Hills (Assam.)

Haunts.—Very opposite opinions prevail as to its haunts. Cantor says it is seldom seen in trees, but more frequently on the ground in the grass. Stoliczka supports this observation, and says though he caught several specimens in the grass, or between low bushes, he but once saw one actually on a bush. Flower on the other hand says his experiences are very different in this as in other matters from those related by Cantor, and he agrees with Günther's suggestion that the reason it is not more often seen in trees is because it makes a too rapid retreat.

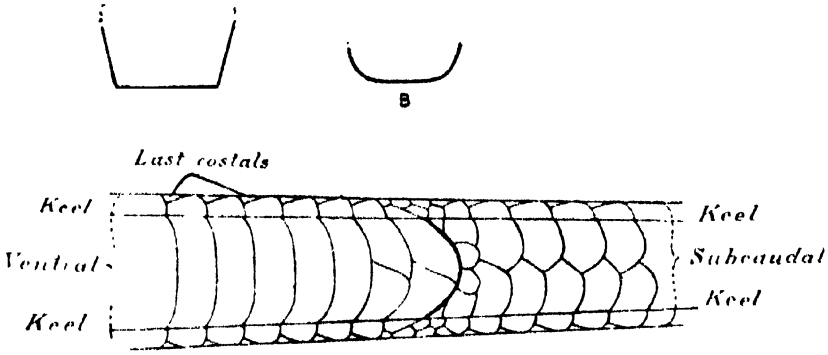

Fig. 1

A. Punt like ventrals of Chrysopelea

B. Boat like ventrals of Lycodon aulicus

C. Rounded ventrals of Cobra

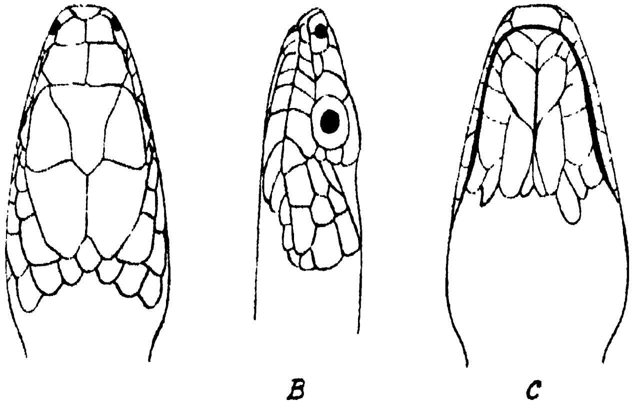

Fig 2
Chrysopelea ornata
(× 1½)

INDIAN SNAKES *(Wall)*

I am able to support both parties, for I have seen it high in a tree on a naked limb, and on several occasions on bushes, or on the trellis work about tennis courts and verandahs. I never met it on the ground myself, but many of the specimens brought me were reported on the ground. I have not the least doubt that the species is essentially arboreal in habit, but this does not prevent it making frequent excursions to the ground either in search of a fresh feeding area, or in the pursuit of the incautious quarry which its keen vision has detected from its exalted station amid the branches overhead.

It is only natural that it should be more frequently encountered on the ground, because the eyes of the pedestrian are directed below the level of his head, even at his feet. Men other than birds-nesters, fern and orchid hunters, and such like do not gaze much aloft, and the snake reclining along a branch or on the top of a trelliswork even about one's own height, will frequently escape detection though but a few feet or even inches away.

The very fact that Cantor and Stoliczka in unison with other observers mention that geckoes are the principal food seems to me to refute their suggestion that *Chrysopelea* is terrestrial in habit, for geckoes are eminently arboreal. It is to be noted also that all the food partaken of, other than geckoes, is of a nature to be obtained by climbing only. Cantor's inclusion of frogs in their dietary does not vitiate this remark, for though he does not say so, the species taken may have been arboreal forms only.

Chrysopelea is not infrequently found about, and actually inside habitations. Flower mentions this, and Evans and I had similar experiences in Burma. I well remember in Colombo, too, one that had taken up its quarters in an old packing case which was full of straw and other packing material. A cooly was ordered to clear this out, and stepped into the box to carry out his orders. His exit reminded one of an incautious bather who has stepped into overhot water. The alacrity of movement so foreign to the cooly's nature was explained by the subsequent discovery of a snake of this species.

Disposition.—Very divergent views again have been expressed on this point. Cantor remarks on the gentleness of the species, whilst Flower on the other hand says " *Chrysopelea ornata* is the fiercest snake I have met. Under circumstances when most snakes, harmless and poisonous alike, would try to glide away quietly, this one will turn to attack the person who disturbs it, and will attempt to resist capture to the uttermost, striking, and biting ferociously. * * * Individuals I have at various times tried to keep in captivity showed no signs of becoming tamer, and would always bite my hand when I put it in the vivarium, and being also an annoyance to the other inmates of the cage, I have only kept them for a few days at a time."

I must say I can abundantly confirm Flower's experiences. There is no doubt that this snake is decidedly plucky, and on occasions fierce, but I would not suggest that all are equally vicious. I think that snakes, like other creatures, exhibit individual character.

I well remember my servant in Rangoon trying to effect the capture of a large specimen in a hedge adjoining my compound. I arrived on the scene when the excitement was at its height and discovered that all the menial establishment amounting to ten or more had been pressed into service. The snake had fought most courageously to elude capture, and struck at any-one who ventured to attempt to grasp it. My boy, confident of master's solatium in the form of a rupee if the creature was captured alive, had been struck at and bitten, and I hardly knew which to admire most, the servant's determination and courage or the snake's vigorous endeavours to retain its liberty.

Flower mentions one in a fit of rage biting itself with such vigour that its teeth were fixed into the side of its body, and I can remember recapturing one which had escaped from my vivarium and had taken refuge between some boards in my house. When extricated after some difficulty, and with the employment of some force, it struck at and buried its teeth in its own body.

The fact that this snake will even face, much less try conclusions with a tuctoo (*Gecko verticillatus*) is eloquent proof of its intrepidity. Flower says: "I have known it eat *Hemidactylus frenatus* and *Gecko verticillatus;* the latter may give battle to the snake for some hours before being finally swallowed." In a recent issue of this Journal I gave two instances of the indomitable courage of this giant gecko. In one instance it was clearly the aggressor, and not only confronted but actually drove back a large rat snake (*Zamenis mucosus*), a species whose courage is well established, and actually during the retreat snapped and bit off part of its tail. In the other instance witnessed and recounted to me by Captain Lloyd, I.M.S., on Sandoway Island when this gecko was in conflict on the ground with a *Chrysopelea ornata*, it would be difficult to say which was the aggressor, but it is probable that the snake engaged the lizard, not expecting to meet a foeman of such prowess.

Food.—*Chrysopelea*, whilst showing a decided partiality towards lizards of the family Geckonidæ, accepts with avidity many other creatures that chance has to offer.

Members of the genus *Hemidactylus* are most frequently found to have furnished the meal, obviously from the relative abundance of the species in this genus and the numerical strength in individuals of many of the species which frequent trees. Many other lizards, however, fall victims to its voracity. Cantor mentions frogs as well, but I have never known one taken, have known them refused in captivity where lizards were accepted, and Mr. Millard tells me also he found frogs were not acceptable. Among other lizards Cantor found *Ptychozoon homalocephalum* taken once, and Evans one of the flying lizards (*Draco tæniopterus*). I have known *Calotes versicolor* taken, and Flower the giant gecko or tuctoo of Burma (*Gecko verticillatus*). Evans and I reported one in this Journal that had eaten a bat (*Taphozous longimanus)*, and Evans has since recorded two instances where bats were devoured. Mr. Millard tells me that in captivity it "feeds freely on bloodsuckers, sparrows, geckoes, and mice, but never eats frogs." He also says it kills by crushing in its folds.

It is interesting to note that Richards* mentions one of his boys having a pet *Chrysopelea ornata* which he fed with milk out of a saucer. He held the snake near the head and put the saucer to it, when it readily drank the milk, and in comparatively large quantities.

Habits.—The striking beauty of this snake, whether seen reclining or moving in its native haunt, could hardly fail to arouse the keenest admiration in the breast of the most unappreciative and phlegmatic disposition.

I watched with admiration recently the adroit, though stealthy, manner in which one in captivity in the Colombo Museum balanced itself, and moved along my walking stick though this was more slender than the snake itself.

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* Landmarks of Snake poison, p. 14.

Dillwyn describes this snake clinging to the trunk of a tree, head downwards, in a very extraordinary manner, and I have seen it under almost exactly similar circumstances. My specimen was stationary, clinging (one could not say reclining) head downwards, about 30 feet from the ground, to a large bare trunk, which rose almost perpendicularly. I marvelled at the tenacity of its grip in such a situation. It had thrown its body into a very wide S across the limb, and it strikes me now very forcibly, after reading Flower's and Shelford's observations, that it may have been "gathering itself" for a leap. The enraptured observer will be even more captivated with the grace and agility attending its movements from branch to branch, and the consummate ease with which it will scale a perpendicular trunk. Its flash-like disappearance aloft without apparent effort must be witnessed to be fully appreciated. I very much doubt whether any snake moving along the flat displays greater speed than this species in its arboreal environment.

But its marvellous attainments do not end here, for this snake is endowed with the capability to spring, or "fly" as some prefer to call this jactatory effort. Here one is forcibly reminded of the eulogistic terms in which the late Professor Owen summed up the athletic performances of these limbless creatures.

He says: "They can outclimb the monkey, outswim the fish, outleap the jerboa, and suddenly loosing the coils of their crouching spiral, they can spring into the air and seize the bird upon the wing."

One has only to be acquainted with *Chrysopelea* to realise that Owen's words convey no fulsome flattery.

That it actually can spring is vouched for by more than one reliable observer. Flower* in 1899 reported having seen "a small one, about 2½ feet long, take a flying leap, from an upstairs window, downward and outward on to a branch of a tree and then crawl away among the foliage. The distance it had jumped was measured, and found to be nearly 8 feet."

Curiously enough in the very month (May) and year (1899) when this record of Flower's was published, Mahon Daly wrote from Siam reporting his having witnessed a similar feat. His letter appeared in Vol. XII, page 589, of this Journal, and though he could not identify the snake he said that he and his Kareen interpreter saw a snake, "about 2½ feet long, sail from a very high tree on one side of the road to a lower one the opposite side."

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* Proc. Zool. Soc. Lond., 1899, p. 684.

In confirmation of these very extraordinary acrobatic feats which I have no doubt many might be inclined to disbelieve is the report made by Shelford of similar performances [*] This observer relates that three native witnesses in Sarawak made a similar statement on three different occasions independently of one another, and at considerable intervals of time.

This was to the effect in each case that the snake had been seen to "fly" from some height to the ground beneath. In all cases the snake was reported to have kept its body rigid during this feat, and to have met the ground at an oblique angle. In one case the snake proved to be *Chrysopelea ornata*, in the second instance a snake of the same genus, *viz.*, *C. chrysochlora*, and in the third *Dendrophis pictus.*

Shelford calls attention to the fact that all these snakes are alike in the peculiar ridged condition of their belly shields, and he made experiments to ascertain the truth of these reports. He says: "A specimen of *Chrysopelea ornata* was taken to a height of fifteen to twenty feet, and allowed to fall several times; after one or two false starts the snake was felt to glide from the experimenter's hands, straightening itself out, and hollowing in the ventral surface as it moved, and it fell not in a direct line to the ground, but at an angle, the body being kept rigid the whole time * * *. If the snake was thrown up into the air, it seemed unable to straighten itself out; it had to be launched, so to speak, from the hands in order to induce it to assume the rigid position."

He implies therefore that these "flights" are not accidental falls but deliberate voluntary efforts, and suggests that the hollowing of the belly between the two ventral ridges may act mechanically after the manner of a parachute, impeding the action of gravity, and buoying up the creature so as to reduce the momentum with which it would strike the ground. He illustrates this point by comparing the fall of a piece of bamboo bisected longitudinally, and the concave face downwards, with that of a piece of bamboo in its cylindrical form.

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[*] Proc. Zool. Soc. Lond., 1906, p. 227.

In the former case the descent is retarded. I prefer the use of the term "springing" to that of "flying" in describing these feats. Its only rivals in acrobatic and scansorial achievements are the tree snakes of the genera *Dendrophis* and *Dryophis*.[*]

Breeding.—Our information on this point is scanty. Evans and I obtained one in May with ovarian follicles impregnated, one in June with 9 eggs in the abdomen, and a small specimen, length not noted, believed to be a hatchling in June. These were all obtained in Rangoon. Since these specimens were recorded in this Journal[†], Evans acquired a specimen from Hanthawaddy, Lower Burma, in June containing 11 eggs; and a brood of 6 young in June in Rangoon.

It is clearly from the above notes not a very prolific species.

The measurements of the eggs were not recorded.

The young in the brood recorded by Evans[‡] measured from 4½ to 6 inches in length.

It is not known whether this snake is oviparous or viviparous. Without being too positive I am inclined to think that the eggs I extracted "ex abdomina" contained embryos in a very early stage of development.

This snake grows 9 or more inches each year, so that the specimens reported by Evans 13½ and 14 inches long in August were the previous year's production.

My smallest prospective mother was 3 feet 7 inches long in June and therefore in her 5th year.

Distribution.—This is very extensive, ranging as it does between the western shores of India on the extreme West, through the Malayan regions (continental and insular), South China to the Philippines in the extreme East.

So far as the Indian Peninsula is concerned its distribution is peculiar, and very interesting. It is only found in a small tract of country in the southern part of the Malabar Coast, and in Eastern Bengal. The accompanying maps show the exact localities where it has been met with.

In Ceylon it is not very uncommon, I met with more than one specimen in a four years' residence though not at that time a collector of

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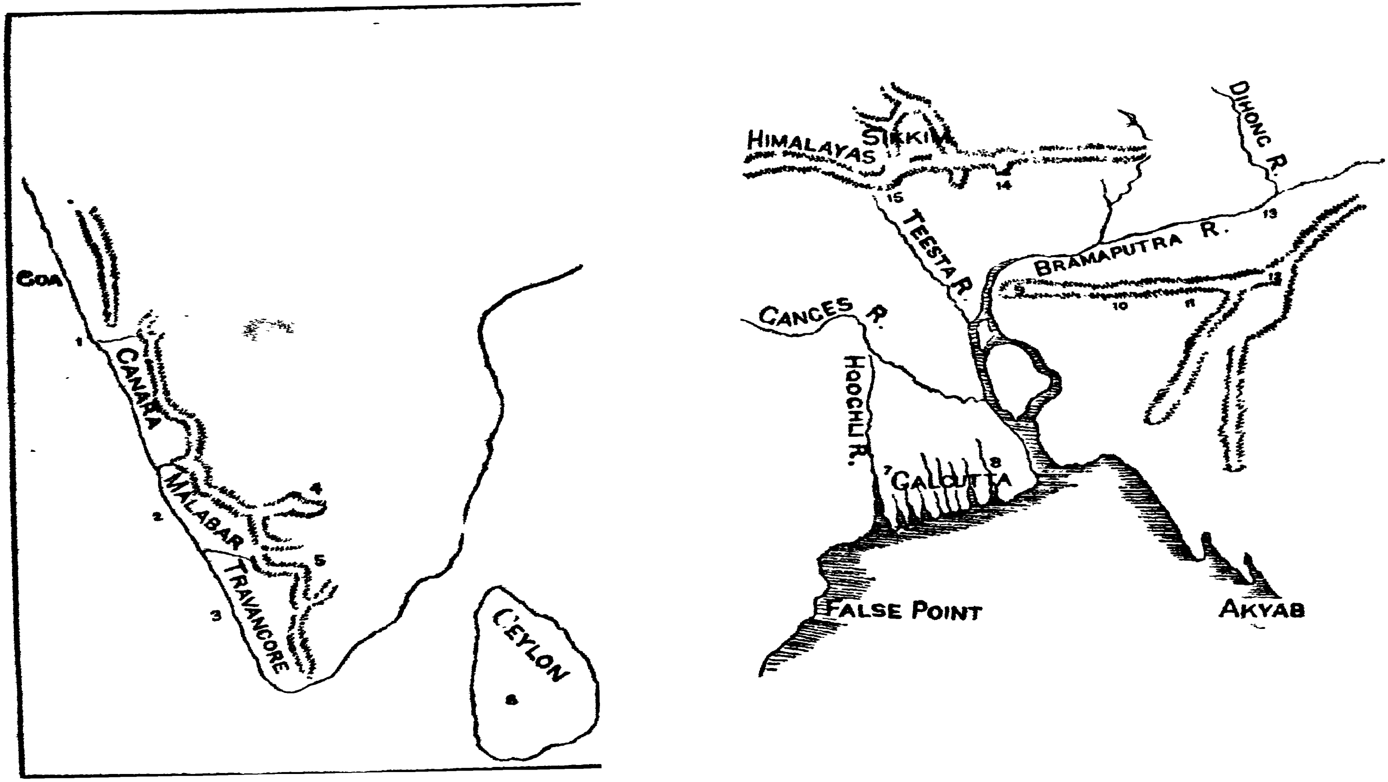
[*] For further remarks on flying snakes see post-script.

[†] Vol. XIII, p. 614.

[‡] Vol. XVI, p. 170.



DISTRIBUTION OF THE GOLDEN TREE-SNAKE (*CHRYSOPELEA ORNATA*) WITHIN INDIAN LIMITS.

snakes. It is referred to by Ferguson, Haly, and Willey from the plains. Mr. E. E. Green tells me he has never heard of it in the hills in that Island, *i. e.* above about 1,500 feet.

It is a fairly abundant species throughout the Malayan Region, and extends throughout Burma. In many parts of Lower Burma it is a common snake (Rangoon, Pegu, etc.). In the extreme south of this Province it has been recorded from Mergui and Tavoy Island (Sclater). Captain Lloyd, I.M.S., captured a specimen on Sandoway Island which I have already referred to. To the east of this Province Sclater has recorded it from Moulmein, and Evans and I had specimens sent to us by Colonel Bingham from the Southern Shan States. The British Museum has a specimen from the same donor from the Ruby Mines, but it appears to be uncommon in that part, for at Mogok Mr. Hampton tells me he has had no specimen in a 9-years' residence.

From Burma it extends to the North, through Assam, and across the Brahmaputra into the Eastern Himalayas, and in a westerly direction into Eastern Bengal, where its exact limits are somewhat uncertain.

It occurs within the Gangetic Delta (Calcutta and Barisal) and it is probable that its western boundary is defined by the Hoogly and Teesta rivers.

It has not as yet been recorded from the Andamans or Nicobars, but Annandale refers to a specimen taken on Narcondam Island by Major Anderson.*

Explanation of Map.

1. Karwar.—Phipson. Bombay Nat. Hist. Soc. Collection.
2. Malabar.—British Museum and Jerdon. (Jourl., Asiat. Soc., Bengal, Vol. XXII, p. 529.)
3. Travancore.—Ferguson. Plains and Hills. (Jourl., Bom. Nat. Hist. Soc., Vol. X, p. 74.)
   Millard. Courtallan in the Hills. (In epistola.)
   Sclater. List, Snakes, Ind. Mus., Calcutta, 1891.
4. Nilgiri Hills.—Kinloch. Kotagiri, 5,700 feet, rare; Kulhatty,† 5,400 feet, Bombay Nat. Hist. Soc. Collection.

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* Jourl., As. Soc. Bengal, Vol. XL, p. 422.

† Mr. Kinloch tells me there are two places called Kulhatty in the Nilgiris—one near Kotagiri, 6,500 feet; another, 5,400 feet.

5. Anamallay Hills.—Thurston. In Madras Museum. (In epistola.)
Beddome. In British Museum Collection.
6. Ceylon.—Haly, Ferguson, Willey. British Museum Collection.
7. Calcutta.—Sclater. In Indian Museum, Calcutta.
8. Barisal.—Bombay Nat. Hist. Soc. Collection.
9. Garo Hills.—Sclater. Indian Museum, Calcutta.
10. Khasya Hills.—Sclater. Indian Museum, Calcutta.
11. North Cachar.—Annandale. Indian Museum, Calcutta.
12. Naga Hills.—Sclater. Samaguting, 2,000 feet. Indian Museum, Calcutta.
13. Nazira.—Sclater. Indian Museum, Calcutta.
14. The Dooars.—Millar. (In epistola.) Specimens in St. Joseph's College Museum, Darjeeling.
15. Darjeeling.—Stoliczka. (Jourl., As. Soc., Bengal, Vol. XL, p. 422.)

Description.—Rostral. Touches 6 shields; the sutures formed with the anterior nasals are twice or nearly twice those formed with the internasals. *Internasals.*—A pair; the suture between them about two-thirds the suture between the præfrontal follows; subequal to or rather less than the internaso-præfrontal suture. *Præfrontals.*—A pair; the suture between them subequal to, or rather greater than the præfronto-frontal suture; in contact with internasal, postnasal, loreal, præocular, supraocular (usually) and frontal. *Frontal.*—Touches 6 shields; the supraocular sutures about three times the fronto-parietals, and about twice the fronto-præfrontals. *Supraoculars.*—Length equal to, or nearly equal to frontal; breadth one-third or more greater than the frontal, at a point opposite middle of eyes. *Nasals.*—Divided; in contact with the 1st and 2nd supralabials. *Loreal.*—One; longer than broad. *Præoculars.*—One; sometimes touching the frontal. *Postoculars*—Two. *Temporals.*—Two small anteriorly; the lower in contact with the 7th and 8th supralabials (sometimes 6th also). *Supralabials.*—9 or 10; the 5th and 6th touching the eye usually (in Burmese specimens), sometimes the 4th also. *Sublinguals.*—Two pairs; the posterior rather larger, and in contact with the 5th and 6th infralabials usually. *Infralabials.*—The first meet to form a suture, half or less than half that between the anterior sublinguals; the 6th largest usually (rarely 5th or 7th) broader than the posterior sublinguals and in contact with two scales behind. *Scales.*—Two heads lengths behind head 17; midbody 17; two heads lengths before vent 13. Absorption from 17 to 15, the 4th row above the ventrals is absorbed into the adjacent row above or below; from 15 to 13 the two rows below the vertebral coalesce. Vertebral row not enlarged, or modified. Costals not oblique. The last row enlarged. Keels absent, or very faint in a few median rows at back of body only; when present cease in the sixes or fours of the supracaudals. Apical pits present. *Ventrals.*—200 to 238 (Boulenger), broad, the last costal row only partially seen on each side when specimen laid on its back. A sharp keel on each side and corresponding notch in the free edge of the shield. The last ventral divided like the anal (Boulenger says sometimes, but I have never seen an exception), and occasionally the penultimate also. *Subcaudals.*—97 to 144. Keeled and notched similarly to the ventrals. *Anal.*—Divided.

Dentition.—Maxillary teeth 20 to 22, subequal, the last three a little longer, and grooved: anterior mandibular teeth longest. (Boulenger.)

FLYING SNAKES.

A Postscript.—At the present day there is a great tendency to discredit any strange stories handed down to us from our forefathers. A certain section of the public, not without some reason however, openly scoffs at improbable stories, especially in connection with snakes, the size of tigers, and other game, fish, etc., knowing the tendency of men to exaggerate.

Many a truth is repudiated, mentally if not verbally, tacitly scoffed at and relegated to the level of a "good story" or a "traveller's yarn".

Certainly many travellers in the past and sportsmen of to-day are to blame for this incredulity. There is no doubt however, that Nature is abundantly more subtle, and prolific in manifestations which are little short of miraculous than is man's inventive genius, which is dwarfed by comparison.

Many of the incredulous school upon enlarging their minds have to acknowledge themselves in error. A quotation such as that I have made use of in my paper from the late Professor Owen, emanating from a less worthy source, would, I feel sure, evoke scepticism, and derision from many.

The fact that we must acknowledge that there are such creatures as "flying snakes" at the present day will doubtless make many who learn this for the first time recall allusions to such beings in the Bible, and it may interest them to discuss the belief in such among the ancients, and subsequently.

The two allusions to "flying serpents" in the Bible occur in Isaiah.

In the original the Hebrew word used is "saraph" in both places, and it is translated as "fiery flying serpent".

The same word occurs in Numbers* (Chap. XXI, verse 6) in its plural form "seraphim," but is here translated simply as "fiery serpent."

The first allusion (Chap. XIV, verse 29) reads as follows:—"Rejoice not thou, whole Palestina, because the rod of him that smote thee is broken: for out of the serpent's root shall come forth a cockatrice, and his fruit shall be a fiery flying serpent."

The second reference (Chap. XXX, verse 6) reads as follows:—"The burden of the beasts of the South: into the land of trouble and anguish, from whence come the young and old lion, the viper and fiery flying serpent, they will carry their riches upon the shoulders of young asses, and their treasures upon the hunches of camels, to a people that shall not profit them."

Isaiah describes the seraphim as follows (Chap. VI, verse 2):—"Each one had six wings; with twain he covered his face, and with twain he covered his feet, and with twain he did fly."

Chamber's Encyclopædia says of them that they were "celestial beings on either side of the throne of Jehovah, seen in prophetic vision by Isaiah, and by him alone." The first allusion (Chap. XIV) refers obviously to these mythical celestial beings, in association with and in fact the progeny of another fabulous being, the cockatrice which the late Canon Tristram says was a creature supposed to be hatched by a cock from serpent's eggs and so represented as a dragon with a cock's head. It was called also "basilisk," or crested serpent. The second reference (Chap. XXX) has far greater interest to the naturalist, because the passage refers to other creatures known to exist, which have been identified with familiar present day forms.

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* Encyclopædia Brittanica.

The context (*viz.*, the first 7 verses of Chapter XXX) shows that the country referred to as "the land of trouble," etc., is Egypt. The lion (*Felis leo*) is a typically African animal, and doubtless occurred in Egypt in the days when Isaiah wrote.

The viper referred to, there is little doubt, is the *Echis carinata*, so common in India, and ranging into Egypt among other parts of Northern Africa. The Hebrew word in the original is "Epheh" which the late Canon Tristram identified as *Echis arenicola* of the present day, an earlier name for *E. carinata*.

The resemblance between this Hebrew word and "Afæ", which is in common use in parts of India for the same snake (Delhi), is noteworthy.†

The "Saraph" used in a passage, which clearly refers to present-day well-known forms like the lion, and the echis, leads one to infer that the creature made reference to was an equally well-known inhabitant of Egypt.

Now the fact that the word "Saraph" in both references in Isaiah is translated in the present version of the Bible as "fiery flying serpent," whilst the same word in Numbers is translated as "fiery serpent," raises the question which of these two renderings is correct. The Encyclopædia Brittanica says if it has a Hebrew etymology it must signify "burning ones" ("consuming" not "fiery"), and again "in Num. XXI, 6, the word "Seraphim" is used of a kind of serpents not "fiery serpents" but burning, *i.e.*, "poisonous ones." From this it appears that there is no confirmatory evidence of the existence of flying snakes in the Hebrew version of the Bible.

It appears probable that the fiery serpent referred to was a poisonous snake so called from the burning pain attending its bite.

It is extremely interesting in the discussion of flying snakes to read what Herodotus wrote nearly 500 years before Christ.

Herodotus (born between 490 and 480 B.C.) wrote: "Arabia is the last inhabited country lying to the southward, and the only region which produces frankincense, myrrh, cassia, and redenum. All those things the Arabians gather with some difficulty, myrrh only excepted.

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† I notice that the Cyclopædia of India (Vol. V., page 227) gives "Aphah" as Hebrew and "Afa" and "Afai" as Arabic words for a "snake" without specifying further.

They collect the frankincense by burning styrax, which the Phœnicians export into Greece, for flying serpents, small of body and with variegated skins, guard the trees which bear the frankincense, a great number round each tree; as for vipers they are found in all parts of the world, but flying serpents are found in thick swarms in Arabia, and nowhere else, and therefore they appear to be very numerous."

Pliny the Elder (born A.D. 23, died 79) mentions serpents that twirl themselves by the tail to a branch of one date tree, and so spring to the branches of another; and says the Arabs call them "flying serpents." This seems to me quite likely in the face of what we know at the present day, if we allow for a certain inaccuracy in the observation. A snake that jumped to another branch would largely depend upon its tail to secure its hold. It would certainly wreath it round the branch upon which it alighted, if in any danger of falling, pending having regained its "foothold." This use of the tail might easily have been misunderstood, and conceived in the light of a spring, and its recoil. Calmet (Augustine) the Benedictine (born 1672, died 1757) refers to the "Seraph" a "flying serpent, the only one that has wings." "Its wings are not feathers, like the wings of birds, but rather like those of bats", and he says "when the Arabian goes to gather the aromatic reed, or cassia, of which these serpents are very fond, they cover all their heads, except their eyes, with skin, to secure themselves from the bite of the serpent, which is very dangerous."

This reads very like a distortion of the truth in a zealous attempt to reconcile fact with dogma. The detailed anatomical peculiarities given by Calmet refer to some creature obviously not a snake, though it might be a flying lizard. It is to be noted, however, that the flying lizards (*Draco*) do not occur as far West as Arabia.

Admiral Lord Anson (born 1697, died 1762) mentions "flying serpents in the Island of Quibo, which darted themselves from the boughs of trees upon man and beast but were without wings."

Niebuhr (born 1733, died 1815), who published the Natural History notes of his friend and fellow-traveller P. Forskal, refers to "flying snakes" in a strain similar to that of Pliny; and Parkhurst, the great biblical scholar (born 1728, died 1797) suggested that the snakes alluded to by these authorities might be the same, or allied forms to those mentioned in the Bible in Isaiah. I think however my foregoing remarks show the first reference purely metaphorical, and the second though obviously literal, a hyperbolic and unwarrantable misinterpretation. What the snakes are or were which were known to the Arabians as flying snakes must remain a matter of speculation. None of the genera which furnish the "flying snakes" of the present day that are known as such, occur in Arabia, but I see no reason why similar saltatory feats should not be performed by other tree snakes known to inhabit that region.

ON THE GENERIC POSITION OF THE GROUPS OF SQUIRRELS TYPIFIED BY "*SCIURUS*" *BERDMOREI* AND *PERNYI* RESPECTIVELY, WITH DESCRIPTIONS OF SOME NEW ORIENTAL SPECIES.

BY

OLDFIELD THOMAS.

In determining a long-nosed Formosan squirrel of the *pernyi* group I have had occasion to study the generic relationship of each of the different forms that have of late years been included in the genus *Funambulus*, and, as might be expected from Dr. Forsyth Major's descriptions of their teeth in his classical work on the subject,*, I find that several different groups should be recognized as distinct genera.

Already something has been done by other authors in this direction, and the genera *Rhinosciurus*, recognized for the species *laticaudatus* and its ally *tupaioides*, *Laria* for *insignis* (with which goes *hosei*), *Tamiops* for *macclellandi* and *Sciurotamias* for *davidianus* (+ *consobrinus*). In addition, I would suggest that generic rank should be accorded to the two following groups. I do not propose to describe them in great detail, as particulars about their skulls and teeth have already been published by Dr. Major.

MENETES, gen. nov.

Skull of the rounded, upwardly convex "*Xerus*" type, approximately of the same character as in *Laria* and the African *Funisciurus*. Teeth more or less hypsodont, the valley between the transverse crests deeply excavated, so that the teeth soon wear into a characteristic horseshoe pattern. P^3 proportionally well developed and standing but little inward of the centre of the tooth-line.

Range.—Burma, Siam, and Malay Peninsula.

Type.—*Menetes berdmorei* (*Sciurus berdmorei*, Bly.).

ZETIS, gen. nov.

Frontal region comparatively flat, as in *Sciurus*, to which this genus would appear to be more nearly allied than to *Funambulus*. Muzzle very much elongated, the distance from the tip of the nasals to the point at which the premaxillo-maxillary suture mounts on to the upper surface of the skull more than the interorbital breadth; lateral profile lines gently sinuous, without sharp concavity at the point above mentioned or strong shoulder at the front end of the zygoma. Postorbital processes small.

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* P. Z. S. 1893, p. 189.

Teeth brachyodont, with low ridges. P^3 small in proportion to p^4.

Range.—S. China and Formosa, Himalayas, Burma, Malay Peninsula and Borneo.

Type.—*Zetis rufigenis* (*Sciurus rufigenis*, Blanf.)

Other species: *lokriah*, Hodgs., *pernyi*, M. Edw., *everetti*, Thos., *pyrrhomerus*, Thos., and the Formosan species described below.

Within the genus there is considerable variation in the development of the snout, *Z. pyrrhomerus* having the longest and *Z. lokriah* the shortest.

This has been long recognized as a natural group, but has been assigned, I now think wrongly, to *Funambulus*, as it would really seem to be a long-nosed ally of true *Sciurus*.

It would therefore have no close relationship to the other long-nosed Oriental form, *Rhinosciurus*, which seems to be a member of the Xerine series of genera, and has teeth remarkably like those of *Menetes*.

In order to assist other workers in the generic reference of the different species of Oriental squirrels I give the following table, which shows the prominent species, including those mentioned under *Sciurus* by Blanford, Hose, and Anderson, sorted according to the modern genera. But I have not attempted to enumerate all the more recently described species, as so many are mere variants of the prominent species included in the table.

Ratufa bicolor.
——— gigantea.
——— indica.
——— macrourus.
——— melanopepla.
——— nanogigas.
——— notabilis.
Sciurus alstoni.†
——— atrodorsalis.
——— brookei.
Sciurus caniceps.
——— castaneoventris.
——— chinensis.
——— concolor.
——— erythræus.
——— ferrugineus.
——— finlaysoni.
——— fraterculus.
——— gordoni.
——— griseimanus.

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† *Surasinorum*, Meyer, is probably a synonym of *alstoni*, Anderson.

Sciurus haringtoni.
—— hippurus.
—— jentinki.
—— leucomus.
—— lokrioides.
—— lowii.
—— melanogaster.
—— modestus.
—— notatus.
—— phayrei.
—— philippinensis.
—— prevostii.
—— pryeri.
—— pygerythrus.
—— quinquestriatus.
—— rosenbergi.
—— rubriventer.
—— steerei.
—— tenuis.
Glyphotes simus.
Tamiops macclellandi.
Zetis everetti.
—— lokriah.
—— owstoni.
—— pernyi.
—— pyrrhomerus.
—— rufigenis.
Funambulus layardi.
—— palmarum
—— pennanti.
—— sublineatus
—— tristriatus.
Laria hosei.
—— insignis.
—— niobe.
Sciurotamias davidianus.
Menetes berdmorei.
Rhinosciurus laticaudatus
Reithrosciurus macrotis
Nannosciurus concinnus
—— exilis.
—— melanotis.
—— whiteheadi.

The three following Oriential squirrels appear to be new :—

Sciurus stevensi, sp. n.

A squirrel like *S. atrodorsalis* when without the black dorsal patch, out with a blue-grey belly.

Size about as in *atrodorsalis*. General colour above almost exactly of the warm grizzled fulvous grey characteristic of the specimens of *atrodorsalis* in which the black on the back is not developed. Under surface and inner side of limbs bluish grey (approximately plumbeous of Ridgway), a colour not found among the many variations of *atrodorsalis*. Head concolorous with back or a little greyer. Ears short, their backs covered with rather long hairs, which are blackish in one specimen, grey in the other; a scarcely perceptible lighter postauricular spot. Hands and feet light grizzled blue-grey. Tail in a general way like back, darkening terminally, the hairs (except those at the extreme tip) ringed with buffy or fulvous and black, their ends with distinct white terminal or subterminal bands. A tuft at the extreme tip of the tail wholly black.

Skull much like that of *S. atrodorsalis*, but with more delicate muzzle, and less convex in the interior frontal region.

Dimensions of the type (measured in the skin) :—

Head and body 230 mm. ; tail 190 ; hind foot (wet) 45; ear (wet) 17.

Skull : fronto-parietal suture to nasal tip 35·3 ; zygomatic breadth 30 ; nasals 15×6·9 ; interorbital breadth 17 : intertemporal breadth 17 ; palatilar length 21 ; combined length of p^4 and m^{1-3} 8 5.

Hab.—Beni-chang, Abor-Miri Hills, northern frontier of Upper Assam. Alt. 4,000′.

Type.—Adult male. B.M. no. 7. 11. 26. 2. Collected 19th February, 1906, by Mr. H. Stevens.

This squirrel seems alone to resemble the non-black-backed examples of *S. atrodorsalis*, but that species is found in a very different area, far to the south of the present locality, and is distinguishable by its differently coloured belly. I have named the new form after its collector, Mr. Stevens, who is one of the very few people who have obtained any zoological specimens in the inaccessible and dangerous region to the north of Assam.

Sciurus pryeri inquinatus, subsp. n.

Similar to true *pryeri* in all important respects except that the under surface and inner sides of the limbs, instead of white, are uniformly pale rufous (rather darker than "vinaceous-cinnamon" of Ridgway). The dorsal colour is rather more vivid than in *pryeri*, owing to the reduction of the black rings on the hairs. Lips and chin grey, interramia and throat rather more yellowish than the rufous belly.

Dimensions of the type (taken on skin) :—

Head and body 267 mm. ; tail 238 ; hind foot (wet) 58 ; ear (wet) 17.

Skull : interorbital breadth 18 ; palatilar length 25 ; length of upper tooth-series, exclusive of p^3, 9-6.

Hab.—Lawas River, western border of British North Borneo.

Type.—B.M. no. 1. 8. 25. 1. Collected and presented by the late J. S. Jameson, Esq.

In spite of the very conspicuous difference involved by the change of the belly-colour from white to rufous, I only make this a subspecies, as one of the Museum examples of *pryeri* has a slight fulvous blush on its under surface, thus showing a tendency to intergradation in this character.

Zetis owstoni, sp. n.

Most nearly allied to *Z. lokriah*, but larger and darker coloured.

General colour above uniform dark finely grizzled olivaceous, the head, body, and limbs being all of much the same tone, though the tips of the digits are blackish. Under surface broadly and conspicuously washed with yellow or orange, the bases of the hairs slaty; in the anal region this colour passes into a ferruginous patch, as in several of the other species. Back of ears with dull whitish hairs, not forming a prominent patch. Tail-hairs for the greater part of their length finely ringed with dull buffy or orange, their ends with a broad subterminal band of black and a white tip.

Skull with a very long muzzle, not equalling that of *Z. pyrrhomerus* in this respect, but coming next after it, the only other squirrel with a longer snout being *Rhinosciurus laticaudatus.*

Dimensions of the type (measured on the skin):—

Head and body 235 mm.; tail 165; hind foot (wet) 47; ear (wet) 23.

Skull: greatest length 54; greatest breadth 30; nasals 18·3×6·1; interorbital breadth 14·5; intertemporal breadth 16·7; palatilar length 23·5; diastema 14; combined length of p^4 and m^{1-3} 8·6.

Hab.—Mt. Arizan, Central Formosa.

Type.—Old female. Original number 63. Collected 6th December, 1906, by native hunters for Mr. Alan Owston, of Yokohama.

This distinct squirrel forms an interesting addition to the small genus *Zetis*, and I have much pleasure in naming it in honour of Mr. Alan Owston, to whom so much of our knowledge of the Japanese and Chinese faunas is due.

It would seem, as with certain other Formosan animals, to be more allied to the Himalayan than to the Chinese members of the group, as may be seen by the following rough synopsis of the species of *Zetis*:—

- A. Tail dully coloured, grizzled.
  - *a*. Belly-hairs yellow or orange terminally.
    - a^2. Colour grizzled brown. Nose less elongated...... *lokriah.*
    - b^2. Colour dark olivaceous. Nose much elongated... *owstoni.*

b. Belly hairs whitish terminally.	
*c*². Tail-hairs broadly white-tipped. A rufous patch on base of tail near anus	*pernyi.*
*d*². Tail-hairs dully orange-tipped. No rufous anal patch	*everetti.*
B. Tail rich ferruginous along its centre below.	
c. Cheeks ferruginous. Outer side of hips grizzled brown.	*rufigenis.*
d. Cheeks not ferruginous. A brilliant rufous patch outside hips	*pyrrhomerus.*

THE DRINKING HABITS OF WILD ANIMALS.

BY

MAJOR R. G. BURTON, INDIAN ARMY.

A great deal of misconception appears to prevail regarding the drinking habits of wild animals; partly due, no doubt, to errors which have crept into works on natural history, and have so been perpetuated. It would be well if the truth on this subject could be cleared up once and for all, and in this matter the evidence of observant sportsmen will be of the greatest value. Many old myths in natural history have already been dissipated, as, for instance, that regarding the length of tigers, of which we read in an old edition of *Chambers' Encyclopædia*—"The tiger is sometimes fifteen feet in entire length to the tip of the tail; an instance is on record of eighteen feet." We should like to see that eighteen footer! Chalk him out on a wall, with the rest of him in due proportion, and see what he looks like!

But errors in a work of natural history are liable to be handed on, and it is thus that many misconceptions are perpetuated. The standard work on the natural history of the Game Animals of India will undoubtedly be, for some time to come, Mr. Lydekker's book, of which a new edition has recently been issued. Indeed, the accumulated knowledge presented in this excellent work is so exhaustive, that at first sight it would appear that there is nothing further to be said on the subject. But Mr. Lydekker himself notes that there are differences of opinion with regard to the drinking habits of wild animals. Whether these differences of opinion really continue to prevail among competent observers is a question that remains to be decided.

I will quote a few paragraphs from Mr. Lydekker's book before proceeding to discuss the matter which forms the subject under review.

Of the sambar he says:—"Whether they require water every day is still a question; but it is well known that they are frequently in the habit of travelling long distances in search of that element."

With regard to the nilgai we are told:—"Nilgai can exist with but a small supply of water, and it is probable that, in the cold season at least, they drink only every second or third day, and that they could go for a considerably longer period without liquid."

Again—"Whether black buck ever drink is a matter on which there is a difference of opinion, but that they can exist without taking liquid seems demonstrated by the occurrence of a herd on a narrow spit of land between the Chilka Salt lake in Orissa and the sea, where for thirty miles the only fresh water obtainable is derived from wells. Exception has been taken to this statement, and the suggestion made that there may be irrigation canals or troughs of water used for cattle. The spot is, however, I believe, perfectly barren.* That there is nothing improbable in the statement is evident from the fact that several kinds of antelopes in the Kalahari desert of South Africa never drink for at least many months in succession."

Of the chikara Mr. Lydekker writes—"Grass and the leaves of bushes and shrubs form its chief nutriment; and although partial to the luscious grass growing in the neighbourhood of water, it is believed by some observers never to drink, being often found during the hot seasons where there is no water except in deep wells. Even in places where water is found, Dr. Blanford states that he never saw the footprints of gazelles among those of animals that came to drink at the pools."

I approach this subject in no controversial spirit but with the desire that a question, on which apparently so much difference of opinion is prevalent, should be finally cleared up. All the animals referred to in the above-quoted extracts are common in many parts of India, and there should surely be no difficulty in arriving at a definite conclusion with regard to their habits.

I may state, to begin with, that my own belief is that all animals drink once in twenty-four hours at least, *where they are able to obtain water.* That is the result of a not inconsiderable experience of jungle life extending over a period of many years. At the same time my observations have been almost entirely limited to the Deccan plateau, so that I am unable to answer for the habits of wild beasts in other parts of the country.

As regards the sambar, I may say at once that my acquaintance with this animal is limited, and principally dates from some seventeen years back; so I must ask for information from more competent observers. I believe the idea that sambar drink only once in three days was first given expression to in Sterndale's Natural History. I recollect being in camp near a pool of water in the Melghat Forest in the hot weather of 1890, when sambar came daily to drink. They drank also at night. But it is impossible to say whether the same animals visited the water each day or night.

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* If it is perfectly barren, what are the wells for?

The nilgai or blue bull, I can say definitely, drinks daily in the Deccan and in the cold weather. In the cold season of 1899-1900, I encamped on two occasions close to a village in the vicinity of which there were very few of these animals. There were, in fact, one herd and one solitary blue bull, and no more, for I knew the country well. The season was one of drought, all the water in the jungle being dried up, and the only water obtainable was in irrigation channels and troughs near the village, to which these and many other animals used to resort nightly. This was proved by their tracks. No doubt they drank at night owing to the proximity of the water-supply to human habitations. In the hot weather I have seen a herd of nilgai pass my camp on their way to drink on two successive days in the heat of the day.

When we come to the black buck, we are on more certain ground. There can surely be no difference of opinion "whether they ever drink." In the Deccan, at any rate, the black buck is addicted to drink. I have seen herds of the animals trooping down to the water to drink, and I have in my possession a photograph, taken in Rajputana, showing a herd at water, some of them in the act of drinking. I raised this question in the columns of the *Asian* some seven years ago, and wrote with reference to the Chilka Lake herd referred to by Mr. Lydekker—"More information is required with regard to this herd. Are there not troughs or irrigation channels from which the animals can obtain water?"

My query brought forth a reply from a gentleman who wrote, under the pseudonymn of "The Judge":—"As to the special tract from which I write, they have an ample supply of fresh water whenever there is rain about, that is from early April, when showers fall in these parts, up to November, when they cease. I visited this morning the south-eastern shores of the Chilka Lake, and on the plain found many of the antelope tracks, but had no time to follow them up; a native with me saw the herd two or three days back. This locality is at the extreme south of Bengal, lat. 19·30 N. and long. 85·15. Everywhere in the plain are hollows where water is now and constantly standing for several months in the year; there are also pools among the sandhills close to the sea, what the Telugu people call 'Dibbula,' and these are common all down the coast. Beside these sources of supply there are also paddy fields having water now [*] in them and a flourishing crop on them. The ordnance map shows the land occupied by them at the present day to have been once a mere swamp. No doubt the struggle for existence has caused them to be reclaimed and cultivated. Thus the antelope of these parts have plenty of water for the present; they are no doubt cousins or descendants of the herds which are or were common about Puri, 50 miles north up the coast, and there is nothing to prevent their migrating there periodically. In 1840, as recorded by the then Chaplain of Cuttack, the natives used to spread a net across the strip, where it was narrow enough for the purpose, and drive them into it. The strip is now too wide for this plan, however; still it remains to be seen whether there is a water-supply for them in the hot weather..............Why should not antelope swim across to the mainland for a drink as undoubtedly do the spotted deer that live on the Chilka islands? In the hot weather the water at the south of the lake is moved up to the north by the strong south winds, and Sir W. Hunter records in his 'Orissa' that the level of the lake is at the north many inches higher than it is at the south owing to this continuous pressure of air on it......I do not know if antelope swim, but possibly they can and may do so under pressure from thirst and otherwise......At all events the antelope at the southern end of the Chilka Lake could easily obtain fresh water by going southwards over the Presidency boundary where the lake ends, and they would find it beyond their strip. Apparently, then, the antelope of the Chilka Lake have only to travel in order to obtain water.[†] And as there are paddyfields, perhaps a hot weather crop is raised on them, as it is in other parts of the country. There are also wells, according to Mr. Lydekker's own showing. As there are wells, they are presumably used for purposes of irrigation, and probably for filling troughs for cattle. Perhaps some one acquainted with the tract of country can furnish information on these points."

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[*] I have not the date of this letter.

[†] Very probably there are seasonal migrations to keep within reach of water.

My query also resulted in a letter to the *Asian* by "G.S.R.", who I think may be recognised as one of the most competent observers in India. "G.S.R." wrote :—"As this particular point (whether antelope and gazelle can exist without water) has for some time engaged my attention, I made special enquiries about it during a recent visit to Bikanir and Jodhpur, where the heat in the hot weather is terrific and antelope with gazelle exist in numbers, and where in the former State water is only obtainable from deep wells, and in the most part also in the latter country. I was informed by several persons, European and native officials, that during the hot season when all the tanks are dried up, herds of antelope and gazelle regularly attend the cattle-drinking troughs in the evenings. In several parts of Jodhpur many persons are kind enough to fill troughs in the jungle away from villages for the benefit of antelope, just as kind people at home feed wild birds during hard winters. In addition to obtaining this supply of water, antelope and gazelle eat largely of the flowers of the 'Ak,' which no doubt contain moisture. Antelope maddened by thirst have been known to jump down village wells. That antelope by the help of eating flowers, etc., can exist for several days without water, seems to be generally held, but not for a longer period than a week during great heat; after that time they die. It has always appeared to me much easier for purely vegetable feeders, like antelope and gazelle, to exist for a considerable time without drinking water to keep themselves alive than it is for carnivorous animals such as wolves and foxes, who frequent similar hot localities as antelope. How can these get water? Well, I was also informed that these animals go for their supply of fluid to the cattle water troughs by the villages, during the night time I conclude. But I think this statement requires further enquiries, as the amount of water left in the cattle troughs after the antelope and gazelle have had sufficient must be extremely small."

As regards the carnivora, I can confirm the statement that they drink from the cattle troughs at night, for I have seen tracks of panthers, jackals, and foxes at such places.

Now for the chikara. I can only say that my experience does not coincide with that of Dr. Blanford. Perhaps the poet was more accurate than the naturalist, when he wrote—

> The wild gazelle on Judha's hills,
> Exulting yet may bound;
> And drink from all the sacred rills
> That gush on holy ground.

I have seen the chikara in the act of drinking at a pool before sunset, when waiting over the water for a panther; and a family of three used to drink nightly at one place near a cantonment where I was stationed some years ago. The cold season of 1899-1900 was one of great drought, and all the water courses were dried up in the part of the Deccan where I was stationed. The only water was contained in the wells and irrigation channels in the vicinity of villages. At these wells the patient laborious cattle toiled all day to draw the water that ran down the channels to irrigate the fields. At night when all was quiet and the watchmen slumbered on their platforms amid the crops, the nilgai always came down and drank where the water was collected, and especially at the wooden troughs, hollowed out of the trunks of trees, which were placed for the cattle near the wells. The marks of their feet might be plainly seen in the soft mud every morning. At night, too, the prowling panther visited such spots, where he might find a victim among the herds of gazelle that trooped down during the hours of darkness from the neighbouring stony and arid hills, or might pick up a stray goat or dog belonging to the hamlet, or a calf that was perishing of want. The gazelles drank here in numbers, leaving a beaten pathway from their jungle haunts.

Around the life-giving water all that passes during the night, all the comings and goings of the beasts of the fields may be read from the book of nature which lies open to the observant eye. There is the beaten track of many dainty little pointed feet, the marks of the gazelle, and the larger spoor of the antelope. The pugs of the panther may be looked for upon any of the dusty paths that approach the trough or water channel. All animals prefer to keep to a beaten track, and their wanderings are thus more easily followed. The porcupines, most nocturnal of creatures, have come down from their cave-dwellings in the banks of the dry ravines and in the hill sides, and one has dropped a quill beside the trough, while another has pierced through the heart a goat that was tied up as bait for a panther in the adjacent nullah. Jackals, wild cats, foxes, hares, peafowl, partridges, quail, all these have passed to and fro at sunset or in the silent watches of the night, and have left unmistakable impress of their presence where they have been to quench their thirst.

There can, then, be no doubt that all the animals in question drink. Whether they can go without drinking, like the antelopes of the Kalahari Desert, is another question. My own impression is that they cannot. No doubt all animals can live and suffer for a time without water. I think there was a human "exhibit" of this nature at the old Westminster Aquarium, where Doctor Tanner also passed forty days without food. The animals of the waterless regions of Africa have apparently adapted themselves to their environment, and are able to abstain from water for considerable periods. Perhaps there are more succulent shrubs in those regions than there are in India, of the nature of the "Ak" mentioned by "G. S. B.", and of the mohwa flower on which so many animals feed. But are there in India waterless regions in which the species referred to have become so adapted to their environment that they can live for long periods without water?

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA."

SERIES III, PART X.

BY

SIR GEORGE HAMPSON, BART., F.Z.S., F.E.S.

(*Continued from page 53 of this Volume.*)

PYRALIDÆ.

GALLERIANÆ.

4144. *d.* MELISSOBLAPTES VINOTINCTA, n. sp. (Plate E., f. 38.).

♀. Head and thorax pale greyish, slightly tinged with brown ; abdomen pale greyish. Forewing pale ochreous grey, suffused and irrorated with vinous red ; subcostal nervure streaked with fuscous grey : a small greyish spot in middle of cell and ill-defined fuscous discoidal spot ; a diffused curved subterminal band from vein 7 to inner margin ; a terminal series of dark striæ. Hindwing pale fuscous grey.

♂. Forewing long and narrow, less suffused with vinous red and irrorated with a few black scales ; a diffused black streak in base of cell, an irregular patch in middle of cell and a diffused streak in upper part of cell towards extremity. Hindwing paler and more ochreous.

Habitat.—CEYLON, Maskeliya (Pole). *Exp.* ♂ 42, ♀ 36 mill. Type in B. M

4149. *a.* LAMORIA FUSCANEURELLA, Rag. Nouv. Gen., p. 51 (1888). id. Rom. Mem. viii., p. 437, pl. 45, f. 13.

Forewing of male with glandular swelling at base of costa.

Differs from *L. planalis* in the large discoidal annulus on forewing ; hindwing more acute at apex and tinged with fuscous instead of being yellowish.

Habitat.—CEYLON, Nawalapitiya (Green), Maskeliya (Pole) ; SINGAPORE ; SUMATRA. *Exp.* ♂ 34, ♀ 42-48 mill.

4150. LAMORIA ADAPTELLA.

This is distinct from the Palæarctic ; *L. anella* ; the male has the base of costa of forewing dilated and hollowed out, but no glandular swelling.

Forewing with the veins streaked with fuscous ; a black mark in cell between the almost obsolete stigmata.

Habitat.—CEYLON. *Exp.* 24-26, mill.

CRAMBINÆ.

4158. Rename CRAMBUS PHÆOPHLEPS, n. sp. C. DELATALIS, Wlk., from Australia being a distinct species.

4161. *a.* CRAMBUS BRACHYRHABDA, Hmpsn., P. L. S. 1906, p. 494, pl. 36, f. 18.

♂. Head, thorax and abdomen black-brown. Forewing fuscous brown with a cupreous tinge ; a white fascia on median nervure emitting very short streaks on veins 2-3-4 ; cilia brown at base, brownish grey at tips. Hindwing fuscous brown ; cilia brown at base, brownish grey at tips.

Habitat.—SIKHIM. *Exp.* 16 mill.

4177. *a.* CRAMBUS DIANIPHALIS, n. sp. (Plate E., f. 10).

Forewing with vein 11 curved and approximated to 12; both wings with veins 4·5 stalked.

♂. Head and thorax white; palpi at sides and patagia tinged with brown; abdomen white dorsally tinged with brown. Forewing white suffused and irrorated with pale red-brown, the costal area deep red-brown; a white fascia from base through the cell to postmedial line, thence diffused to termen below apex; an oblique irregular black-brown discoidal bar, dilated below; a very highly dentate postmedial line from costal area to inner margin, some of the teeth almost reaching termen; a fine brown terminal line. Hindwing greyish brown..

♀. Forewing with the white fascia narrower and not reaching beyond postmedial line, the discoidal bar obsolescent.

Habitat.—CEYLON, Maskeliya (Green). *Exp.* 28 mill. Type in B. M.

4185. *b.* PLATYTES ARGYROTRICHA, n. sp.

Forewing with vein 10 stalked with 8·9; 11 anastomosing with 12.

♂. Head, thorax and abdomen white tinged with rufous, the last with some fuscous irroration. Forewing white suffused with rufous except on costal and inner areas and sparsely irrorated with large black scales; the terminal half of costa with three oblique rufous striæ and two oblique lines from costa to vein 7 near termen, the apex white with a yellow patch; a fine terminal dark line from costa to vein 4 followed by a yellow patch extending to submedian fold with two black points on it; cilia silvery with a fine dark line near base. Hindwing white tinged with pale yellow-brown except at apex; cilia with two fine brown lines on apical half.

Habitat.—ASSAM, Khasis. *Exp.* 18 mill. Type in B. M.

4193. *a.* PLATYTES ACROPERALIS, n. sp. (Plate E., f. 11).

Head and thorax pale brown mixed with whitish; abdomen grey, dorsally tinged with fuscous. Forewing very narrow, the apex produced, the termen very oblique; pale red-brown mixed with white; a white fascia on median nervure; an interrupted black streak in submedian fold from before middle to termen and another in discal fold from middle of cell to beyond the cell; an oblique, minutely dentate postmedial line, the area beyond it mostly white; a terminal series of black points. Hindwing pale fuscous brown.

Habitat.—CEYLON, Maskeliya (Green). *Exp.* 14 mill. Type in B. M.

SCHŒNOBIANÆ.

4255. *b.* PATISSA INTERSTICALIS, n. sp. (Plate E., f. 30).

♂. White; palpi blackish at sides; mid and hind legs tinged with fuscous.

Forewing with broad brown streaks in all the interspaces. Hindwing pure white.

Habitat.—CEYLON, Kosland, 1,000′ (Mackwood). *Exp.* 24 mill. Type in B.M

ANERASTIANÆ.

4290. *a.* ANERASTIA STICTELLA, n. sp.

Palpi of male hollowed out to receive the brush-like maxillary palpi, antennæ with sinus at base of shaft containing a ridge of scales.

Head and thorax pale brownish with a very slight pimplish tinge; abdomen dorsally ochreous, ventrally whitish. Forewing pale; the costal area whitish suffused by reddish brown below, the inner area slightly suffused with purplish red; a medial black spot on vein 1; a spot below lower angle of cell; postmedial spots on veins 3·2 and 1; some dark points on termen. Hindwing ochreous white, the termen slightly tinged with brown.

Habitat.—PUNJAB, Kangra Valley, 4,500′ (Dudgeon). *Exp.* 22 mill. Type in B. M.

4366. *a.* CRITONIA HOLORHODA, n. sp.

♀. Head and thorax rose-pink; hind legs and abdomen ochreous. Forewing rose-pink, the veins with slightly darker streaks defined by faint pale streaks above. Hindwing white tinged with ochreous.

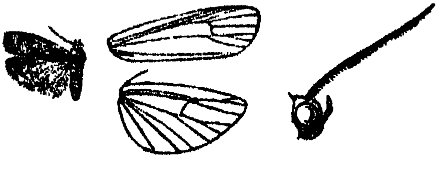
Habitat.—CEYLON, Pundaloya (Green). *Exp.* 30 mill. Type in B. M.

PHYCITINÆ.

Genus NONIA. Type.

Nonia.—Rag. Rom. Mem. viii., p. 260 (1901). .. .. *exiguella.*

Proboscis present; palpi upturned, slender, reaching about vertex of head; frons smooth; antennæ of male ciliated; tibiæ moderately fringed with hair. Forewing narrow, the apex rounded; vein 2 from towards angle of cell; 3·5 stalked, 4 absent; 6 from below upper angle; 9 absent; 10·11 from cell. Hindwing with vein 2 from near angle of cell; 3·5 stalked, 4 absent; 6·7 from upper angle, 8 anastomosing with 7 to near apex.



Nonia taprobalis ♂ ½.

4316*a.* NONIA TAPROBALIS, n. sp.

♂. Head and thorax dark-brown slightly tinged with grey; pectus, legs and abdomen grey tinged with brown. Forewing dark-brown mixed with some grey; the 1st line almost medial, grey slightly defined by fuscous on outer side, very oblique from costa to submedian fold, then inwardly oblique; a faint discoidal point; the 2nd line subterminal, whitish, almost straight, erect; a fine pale line at base of cilia. Hindwing whitish tinged with brown; a fine dark terminal line; cilia white with a brown line through them.

Habitat.—CEYLON (Alston). *Exp.* 12 mill. Type in B. M.

Genus TINESTRA, nov.

Palpi upturned and reaching well above vertex of head; maxillary palpi filiform; antennæ of female ciliated. Forewing with veins 3 and 5 from angle of cell, 4 absent; 6 from below upper angle; 9 absent; 10·11 from cell. Hindwing with vein 2 from angle of cell, 5 from above angle, 3·4 absent; 6·7 from upper angle; 8 confluent with 7 to apex.

4316. *a.* TINESTRA MICHALIS, n. sp.

♀. Grey tinged with brown; palpi with the 2nd and 3rd joints banded with blackish. Forewing with the basal area somewhat browner, the rest of wing irrorated with black ; the 1st line double filled in with yellowish, almost medial, oblique and slightly bent inwards to costa ; two prominent black discoidal points ; postmedial line double filled in with yellowish, almost obsolete and bent inwards to costa, then erect ; subterminal line punctiform, black, slightly incurved below costa, then excurved to submedian fold ; a terminal series of black points. Hindwing grey tinged with brown.

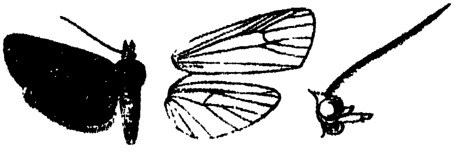
Habitat.—CEYLON, Rambukkhana (Alston). *Exp.* 10-12 mill. Type in B. M.

Genus. CROCIDOPORA.

Type.

Crocidopora, Meyr., P. Linn., Soc. N. S. W., vii, p. 158 (1882), ... *cinigerella.*

Palpi porrect, the 2nd joint extending about twice the length of head and thickly scaled, the 3rd moderate ; maxillary palpi of female dilated with scales ; frons rounded ; antennæ of female ciliated. Forewing with vein 2 from near angle of cell ; 3·5 from angle, 4 absent ; 6 from upper angle ; 8·9 stalked : 10·11 from cell. Hindwing with vein 2 from angle of cell ; 3·5 stalked. 4 absent ; 6·7 from upper angle, 7 anastomosing with 8 to near apex.



Crocidopora phaealis ♀ ⅗.

4325. *a.* CROCIDOPORA PHÆALIS, n. sp.

♀. Head, thorax and abdomen black-brown slightly mixed with grey ; tarsi tinged with white. Forewing fuscous tinged with purplish and slightly irrorated with grey ; antemedial line represented by a diffused oblique whitish striga from costa to median nervure ; a whitish patch on middle of costa ; traces of a black discoidal lunule ; postmedial line very ill-defined, whitish, excurved at middle ; subterminal line represented by some diffused whitish scales. Hindwing fuscous ; cilia grey with a fine whitish line at base.

Habitat.—CEYLON, Maskeliya (J. Pole). *Exp.* 26 mill. Type in B. M.

4325. *a.* HOMŒSOMA GLAUCOCHROA, n. sp.

♀. Head, thorax and abdomen grey tinged with brown ; palpi blackish except at base. Forewing grey irrorated and in parts suffused with red-brown ; the 1st line almost medial, grey, excurved from costa to below cell, then slightly angled inwards in submedian fold, a brown patch before it on inner area defined by fuscous on inner side ; the 2nd line grey slightly defined on each side by brown, excurved at middle ; a terminal series of rather elongate black points. Hindwing semi-hyaline whitish, the terminal area tinged with brown ; cilia white with a slight brown line near base.

Forewing with veins 4·5 from cell ; hindwing with the cell very short, the discocellulars oblique, veins 3 and 5 strongly stalked, 2 from angle. This species will probably require a new genus when the male is discovered.

Habitat.—CEYLON, Matale (Pole). *Exp.* 12 mill. Type in B. M.

Genus. MESCINIADIA. Type.

Mesciniadia, Hmpsn., Rom. Mem., viii, p. 121 (1901) ... ... *infractalis.*

Proboscis clothed with scales towards base; palpi erect, the 3rd joint as long as the 2nd extending to well above vertex of head and with a triangular tuft of black scales in front; maxillary palpi filiform; frons smooth; antennæ of male with tufts of scales at the joints. Forewing long and narrow; veins 2 and 3 strongly stalked from angle of cell, sometimes from a point in female; 4·5 strongly stalked (in the Ceylon specimen coincident) from angle of cell; 6 from upper angle; 8·9·10 stalked; 11 from cell. Hindwing with the costa strongly arched near base and with tuft of long hair on upper side below costa; cell long; vein 2 from angle; 3 and 5 strongly stalked, 4 absent; 6·7 stalked; 8 anastomosing with 7 to near apex.

4325. *b.* **MESCINIADIA INFRACTALIS**, Wlk. xxx, 958 (1864); Hmpsn. Rom. Mem. viii, p. 121, pl. 48, f. 7.

Head, thorax and abdomen pale brownish ochreous; palpi black at tips Forewing pale brownish ochreous irrorated with brown, the terminal area suffused with fuscous except at costa; the 1st line indistinct, blackish, oblique below the cell, with a rufous tinge before it on inner area and slight blackish mark beyond it in and below cell; a slight blackish discoidal point; a postmedial blackish point on costa. Hindwing semi-hyaline whitish, the veins and termen tinged with brown.

Habitat.—CEYLON, Maskeliya (Alston); BORNEO, Sarawak. *Exp.* 12 mill.

4332. *b.* **HETEROGRAPHIS FALSALIS**, n. sp.

♀. Head, thorax and abdomen brownish ochreous mixed with grey; tarsi fuscous tinged with white. Forewing grey tinged with ochreous and irrorated with fuscous; a diffused patch of black scales on inner area before the 1st line which is almost medial, blackish defined by pale grey on inner side, excurved from costa to submedian fold, angled inwards on vein 1 and oblique to inner margin; two prominent black discoidal points, the lower rather elongate; the 2nd line subterminal, pale grey slightly defined on each side by fuscous and blackish points, slightly angled inwards at vein 1; a terminal series of black points. Hindwing white; a fine brown terminal line; cilia with a fine brown line near base from apex to vein 2.

Habitat.—MADRAS Gooty (Campbell). *Exp.* 20 mill. Type in B. M.

4341. *d.* **EUZOPHERODES ALBISTRIGELLA**, n. sp. (Plate E., f. 13.)

Forewing with veins 3·5 from cell; 10 from cell.

Head and thorax greyish fuscous; abdomen grey tinged with fuscous. Forewing fuscous brown with grey-white streaks in the interspaces to the subterminal grey line which is oblique and angled inwards in submedian fold; termen with some grey irroration and a series of black points. Hindwing pale semi-hyaline tinged with fuscous, especially towards termen.

Habitat.—CEYLON, Maskeliya (Pole). *Exp.* 30 mill. Type in B. M.

4341. *e.* **EUZOPHERODES PROLEUCALIS**, n. sp.

Forewing with veins 3·5 from cell, 10 from cell.

♀. Head, thorax and abdomen dull brown mixed with grey. Forewing dull reddish brown irrorated with white; the costal area white to near apex; antemedial line white oblique from costal area to submedian fold, then incurved; an ill-defined white streak in end of cell, and a discoidal bar; a diffused oblique white bar beyond the cell between discal and submedian folds; postmedial line white, angled outwards at discal fold, oblique to submedian fold, then bent outwards. Hind wing pale brown.

Habitat.—PUNJAB, Kangra Valley, 4500′ (Dudgeon). *Exp.* 18 mill. Type in B. M.

4341. *f.* EUZOPHERODES HEMIPHÆA, n. sp.

♀. Head and thorax red brown with a cupreous gloss; pectus, legs and abdomen grey. Forewing with the basal half red-brown, the terminal half grey tinged with red-brown: the 1st line just beyond the dark area, oblique from costa to discal fold, then incurved; a yellowish discoidal mark; the 2nd line subterminal, whitish defined by fuscous brown on inner side and with the area beyond it rather more suffused with brown, slightly excurved at middle. Hindwing whitish tinged with brown.

Habitat.—CEYLON, Matale (Pole). *Exp.* 12 mill. Type in B. M.

4342. *a.* EUZOPHERA ECTOPHOEA, n. sp. (Plate E., f. 19.)

♂. Head, thorax and abdomen brownish ochreous; palpi fuscous. Forewing brownish ochreous, with slight brown irroration; the costal area whitish to subterminal line leaving the costal edge brown; antemedial line oblique, ending on middle of inner margin; a fuscous discoidal bar; subterminal line whitish, defined on inner side by fuscous suffusion from below costa extending on inner margin to antemedial line, on outer side by a strong black line, bent outwards to apex and with some fuscous suffusion beyond it towards inner margin; a terminal series of black points. Hindwing whitish tinged with brown, especially towards termen; cilia whitish with a fuscous line through them.

Habitat.—CEYLON (de Mowbray). *Exp.* 18 mill. Type in B. M.

4343. *d.* EUZOPHERA COCCIPHAGA, n. sp. (Plate E., f. 12.)

♂. Head, thorax and abdomen greyish brown; palpi blackish; tarsi with slight pale rings. Forewing grey brown with slight dark irroration; a double, somewhat diffused and slightly curved medial black line with some dark suffusion beyond it on costa; a black discoidal bar; subterminal line double filled in with grey, oblique, slightly excurved at middle, the area beyond it suffused with fuscous; a punctiform black terminal line and slight pale line at base of cilia. Hindwing greyish suffused with fuscous, the termen darker; a pale line at base of cilia.

Habitat.—SIKHIM. *Exp.* 24 mill. Type in B. M.

The larva lives under a coccid on which it feeds.

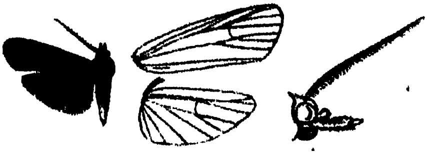
Genus. NEASARTA, nov.

Type—*N. nycticlroalis.*

Proboscis well developed; palpi porrect, extending about three times length of head, triangularly scaled, the 3rd joint hidden in hair; maxillary palpi dilated with scales; frons smooth; antennæ of female ciliated; tibiæ smoothly scaled. Forewing narrow; veins 3 and 5 from angle of cell, 4 absent; 6 from upper angle; 8·9 stalked; 10 from cell, approximated to 8·9; 11 from cell. Hindwing with vein 2 from long before angle of cell; 3 and 5 from angle, 4 absent; 6·7 from upper angle; 8 anastomosing with 7 to near apex.

4346. *b.* NEASARTA NYCTICHROALIS, n. sp.

♀. Black-brown; tarsi ringed with white. Forewing irrorated with greyish and faintly tinged with purple; a faint diffused obliquely curved antemedial greyish band; a pale point on costa towards apex; cilia with a fine pale line at base followed by a dark line. Hindwing with a faint purplish tinge; cilia with a fine pale line at base followed by a dark line.



Neasarta nyctichroalis. ♀ $\frac{3}{2}$

Habitat.—CEYLON, Maskelyia (J. Pole). *Exp.* 18 mill. Type in B.M.

4355. *a.* NEPHOPTERYX HEMIARGYRALIS, n. sp.

♂. Head ochreous tinged with rufous; palpi brown, rufous at tips; antennæ blackish; tegulæ rufous; thorax brown suffused with leaden grey; pectus and legs ochreous white, the tarsi brown slightly ringed with white; abdomen reddish brown. Forewing red-brown, the costal area broadly silvery white slightly irrorated with brown, the costal edge tinged with rufous and with dark brown streak on medial area, the white extending to vein 1 beyond antemedial line and on terminal area to vein 2; antemedial line double, black filled in with white, obsolete on costal area and below vein 1, oblique from subcostal nervure to below cell when there is a small black spot on its outer edge, then bent inwards; two large black discoidal points; postmedial line white defined on each side by brown, oblique from costa to discal fold where it is angled inwards, angled outwards at vein 5, then oblique and very minutely dentate; a terminal series of small black spots; cilia pale brown with a fine whitish line near base. Hindwing whitish uniformly suffused with brown; a fine dark terminal line; cilia pale brown with a fine whitish line at base followed by a slight brown line.

Habitat.—ASSAM, Khasis. *Exp.* 24 mill. Type in B.M.

4363. *a.* NEPHOPTERYX (*Salebria*) ATRIBASALIS, n. sp.

Head and thorax white irrorated with black; the tufted maxillary palpi fulvous at tips; tibiæ and tarsi banded with black; abdomen whitish irrorated and suffused with fuscous, the anal tuft tinged with ochreous. Forewing white irrorated with black and tinged with grey except the costal area to postmedial line; the basal area below the cell suffused with fuscous; antemedial line white, oblique, defined by black on outer side from costa to median nervure, then by black on inner side; the discoidal points in the form of short black streaks at upper and lower angle of cell; postmedial line white strongly defined on each side by black towards costa, then slightly defined, oblique, sinuous, excurved middle ; a black terminal line ; cilia with fine black line near base and slight line near tips. Hindwing white tinged with brown ; a brown terminal line.

Habitat.—BELOOCHISTAN, Quetta (Nurse). *Exp.* 16 mill. Type in B. M.

4383. *a.* MYELOIS ALBICOSTALIS, n. sp.

♀. Head and thorax whitish tinged with brown ; palpi with the 3rd joint long and banded with black ; abdomen white, dorsally slightly tinged with brown. Forewing whitish suffused with pale ochreous brown and with white fascia on costa ; antemedial line very indistinct, white, bent inwards to costa ; a crimson patch on middle of inner margin ; subterminal line white, excurved and very minutely waved at middle, with a small crimson spot before it on inner margin ; a terminal series of slight black points. Hindwing white faintly tinged with brown ; a slight brown terminal line ; cilia white.

Habitat.—CEYLON, Matale (Pole). *Exp.* 14 mill.

4387. *b.* PHYCITA DEODARALIS, n. sp.

Head and thorax white mixed with fuscous-brown scales ; tarsi banded fuscous and white ; abdomen grey-white irrorated with fuscous and with slight fuscous dorsal line. Forewing white faintly tinged with olive and irrorated with brown ; diffused oblique subbasal and antemedial fuscous brown bands from subcostal nervure to inner margin ; the 1st line almost medial, diffused, fuscous strongly defined by white on inner side, oblique from costa to submedian fold, then slightly incurved ; two large discoidal fuscous points with a faint incurved diffused line from the lower to inner margin ; subterminal line strong, white defined by fuscous on inner side, excurved at middle and slightly angled inwards in discal and submedian folds ; a terminal series of blackish points ; cilia whitish mixed with pale brown. Hindwing whitish tinged with brown, the cilia white.

Habitat.—KASHMIR, Dras (Leech). *Exp.* 22-26 mill. Type in B.M.

4389. PHYCITA CYCLOGRAMMA. Maxillary palpi of male brush-like in a hollow of the labial palpi ; antennæ with sinus and double tuft at base and uniseriate branches. Allied to *P. pectenella.*

4389. *b.* PHYCITA ENDOMELÆNA, n. sp. (Plate E, f. 33).

Head and thorax grey mixed with a few fuscous scales, the tegulæ faintly tinged with purplish red ; palpi black except at tips ; legs tinged with brown, the tarsi fuscous ringed with grey ; abdomen grey tinged with brown. Forewing grey irrorated with red-brown especially on costal area ; the basal half of inner margin blackish expanding into a large patch before the 1st line which is medial, grey defined on each side by red-brown suffusion, oblique, very slightly sinuous ; the discoidal points represented by two minute black streaks and two minute streaks beyond lower angle of cell ; subterminal line grey, defined on each side by red-brown, excurved below costa, then slightly oblique ; a terminal series of prominent black points ; cilia with a fine whitish line at base. Hindwing semi-hyaline grey white ; a fine dark terminal line ; cilia whitish with dark line through them.

Habitat.—CEYLON, Maskeliya (Pole, Alston). *Exp.* 26 mill. Type in B.M.

4390. *a.* PHYCITA EUZONALIS, n. sp.

♀. Head and thorax brown mixed with grey; vertex of head whitish; palpi whitish banded with brown; legs banded with fuscous, the tarsi with slight pale rings; abdomen grey-brown with slight white segmental lines. Forewing with the base brown slightly irrorated with white; a broad antemedial band ochreous on inner side, white on outer and at costa, defined on each side by lines of raised metallic blackish scales; medial area suffused with dark-brown; a diffused white patch from costa to lower angle of cell with the two brown discoidal points on it; terminal area whitish suffused and irrorated with yellow-brown; subterminal line white defined on each side by dark brown, slightly excurved below vein 6; a series of slight black points just before termen; a fine yellow-brown terminal line. Hindwing semihyaline white, the veins and apex tinged with brown; a fine brown terminal line and brown line near base of cilia.

♂. Head, thorax and base of abdomen more rufous, the terminal part of abdomen and anal tuft blackish; hind tibiæ strongly dilated and with large black patch; forewing with the basal area tinged with rufous, the terminal half more uniform brown.

Habitat.—CEYLON, Maskeliya (Pole), Madulsima (Vaughan). *Exp.* 26-28 mill.

4394. *a.* PHYCITA DEEINALIS, n. sp. (Plate E., f. 21).

♀. Head, thorax and abdomen yellow-brown mixed with whitish; palpi black at tips; fore legs fuscous; hind legs white with blackish marks on tibiæ at middle, on inner side at extremity and on spurs, the tarsi blackish ringed with white. Forewing yellow-brown with dark irroration, the costal area white irrorated with black; antemedial line black defined by white on inner side, very oblique from costa to median nervure, then erect; two prominent black discoidal points; subterminal line black defined by white on outer side, oblique, somewhat incurved and very slightly angled outwards at middle; a punctiform black terminal line. Hindwing whitish tinged with brown and with fine dark terminal line; cilia brownish white with fine pale line at base.

Habitat.—CEYLON, Puttalam (Pole). *Exp.* 14 mill. Type in B.M.

4410. *c.* RHODOPHÆA ALBIRENALIS, n. sp. (Plate E., f. 22).

♀. Head and thorax yellow-brown tinged with whitish; palpi with black marks on sides of joints and the extremity of 3rd joint black; femora and tibiæ whitish irrorated with fuscous, the hind tibia with black patch on inner side at extremity and the spurs black; abdomen yellow-brown. Forewing ochreous brown with some dark irroration, the costal area whitish; antemedial line blackish defined by white on inner side, angled outwards on subcostal and median nervures and inwards in cell, incurved below the cell; a white discoidal lunule with slight dark points above and on outer side and a slight streak above it on costa; subterminal line white defined on each side by blackish, the black on outer side bent outwards to apex, angled outwards below costa, then sinuous; a terminal series of black points; a pale line at base of cilia. Hindwing pale brown, the termen slightly darker; cilia whitish with a dark line through them.

Habitat.—CEYLON, Uva (Alston). *Exp.* 22 mill. Type in B.M.

4421. *a.* SPATULIPALPIA HÆMAPHORALIS, n sp. (Plate E., f. 20.)

Palpi of male long, the 2nd joint with fringe of long hair behind, the 3rd moderate and nearly smooth; maxillary palpi thickly tufted with scales; antennæ with the basal joint long, the shaft laminate and recurved towards base.

♂. Head and thorax pale rufous; palpi blackish above; pectus and legs whitish, the latter slightly irrorated with rufous, tarsi fuscous with pale rings; abdomen ochreous slightly tinged with fuscous on dorsum. Forewing pale fuscous with a purplish tinge; a white streak from base below costa, then curved downwards to lower angle of cell to join a white streak on median nervure, the cell below the curved streak and a slight streak below median nervure blood-red; a wedge-shaped black spot defined by white just beyond the cell with a black spot above it below costa; the terminal half of costal area white slightly irrorated with brown and with fine black streaks on the veins below costa; an oblique subterminal series of white points; some blackish points on termen; a fine white line at base of cilia. Hindwing semihyaline fuscous, the veins darker.

Habitat.—CEYLON, Uva, 3000′ (Alston). *Exp.* 18 mill. Type in B.M.

4429. *a.* THIALLELA ENDOCHRALIS, n. sp.

♂. Head, thorax and abdomen ochreous yellow. Forewing red-brown mixed with greyish; a deep crimson fascia on costa from before middle to near apex, another on median nervure from before middle to beyond the cell where it expands; an ochreous yellow medial patch from cell to inner margin, constricted at middle with some crimson on its inner edge and a crimson patch beyond it on inner margin; a small whitish discoidal spot; subterminal line slight, ochreous, somewhat excurved and minutely waved at middle, expanding into a spot on inner margin. Hindwing yellowish suffused with brown; cilia of both wings brown with a yellow line at base.

Habitat.—CEYLON, Matale (Pole). *Exp.* 16 mill. Type in B.M.

4433. *c.* EPISCHNIA IRRARALIS, n. sp.

♀. Head and thorax white irrorated with some brown and fuscous scales; abdomen white irrorated with fuscous and dorsally tinged with brown. Forewing white irrorated with fuscous and largely suffused with brown except on costal area; a white streak above median nervure and vein 5; antemedial line represented by short obliquely placed blackish streaks on costa, subcostal and median nervures and a streak nearer base on vein 1; an elongate blackish point at lower angle of cell; a very indistinct diffused brown oblique line from costa before apex to beyond lower angle of cell with another indistinct diffused oblique line between veins 5 and 2; a faint diffused minutely waved fuscous line just before termen; a slight brown terminal line; cilia with brownish lines at middle and near tips. Hindwing whitish tinged with ochreous brown; a slight dark terminal line; cilia white with a pale brown line near base.

Habitat.—KASHMIR, Dras (Leech). *Exp.* 26 mill. Type in B.M.

EPIPASCHIANÆ.

4445. **MACALLA VALIDALIS**, insert *Orthaga basalis*, Swinh. A. M. N. H. (7) xvii, p. 556 (1906), nec Leech.

ENDOTRICHINÆ.

4508. *a.* **HENDECASIS MINUTALIS**, Hmpsn., A. M. N. H. (7), xvii, p. 214 (1906).

♂. Palpi extending about the length of head, the 3rd joint minute; forewing with veins 7 and 10 stalked, 8·9 absent.

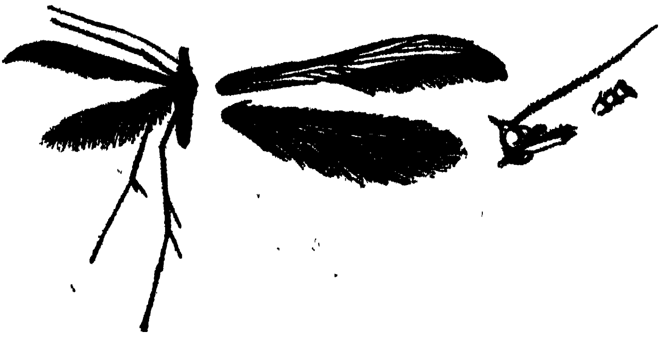
White; palpi slightly tinged with rufous at sides; wing slightly tinged with rufous. Forewing with black point below base of cell; an oblique, fuscous, almost medial line from cell to inner margin and traces of a fine brown line from costa beyond middle to inner margin near tornus. Hindwing with oblique brown antemedial line and faint sinuous line from costa beyond middle to tornus.

Habitat.—CEYLON, Hambantota. *Exp.* 12 mill.

Genus. OXYCHIROTA. Type.

Oxychirota, Meyr. Trans. Ent. Soc., 1885, p. 438 ... ... *paradoxa*

Proboscis well developed; palpi porrect, the 2nd joint extending about 1½ times length of head in the Australian species, about twice in the Ceylon species, and fringed with long scales above, the 3rd small, acuminate; maxillary palpi about half length of labial and dilated with scales; frons with conical prominence; antennæ nearly as long as forewing and annulated with scales at the joints; head globular; leg very long; tibiæ with the outer spurs half length of inner, the outer medial spur of hind tibia minute. Forewing linear lanceolate, the costa curved towards apex and fringed with hair; the inner margin and termen nearly in a straight line and fringed with very long cilia from middle of inner margin to apex, the inner margin with slight scale teeth; veins 2, 3, 4, very short; 5 from near 4; 6 from middle of discocellulars; 7, 8, 9, 10 stalked; 10 from beyond 7; 11 from near angle of cell; 12 free. Hindwing linear fringed with long cilia on costa and inner margin which has small scale teeth; veins 2, 3, 4 short and very indistinct; 5 from a point with 4; discocellulars nvisible; 7 from 6 anastomosing with 8 to middle of wing.



Oxychirota ceylonica. ♂

4508. *b.* OXYCHIROTA CEYLONICA, n. sp.

♂. Head, thorax and abdomen rufous mixed with some whitish. Forewing rufous overlaying pale scaling and with slight dark irroration; the scale teeth on inner margin black; black points at middle and end of cell. Hindwing rufous overlaying pale scaling and with slight dark irroration, the scale teeth on inner margin black.

Habitat.—CEYLON, Peradeniya (Thwaites). *Exp.* 14 mill. Type in B. M.

PYRALINÆ.

4522. *a.* PYRALIS GENALIS, Hmpsn. A. M. N. H. (7), xvii, p. 254 (1906).

♂. Head and thorax purplish grey mixed with reddish brown; legs whitish, the fore tarsi black with whitish rings; abdomen purplish grey with obscure dark dorsal bands. Forewing purplish grey irrorated with dark reddish brown; a dark patch at base of costa; antemedial line dark brown, expanding into a patch at costa, excurved at median nervure and above inner margin; some brown points on medial part of costa; a dark discoidal spot; postmedial line expanding into a patch on costa and defined by whitish on outer side, angled inwards below costa, excurved and minutely dentate, between veins 5 and 2; a terminal series of dark points. Hindwing yellowish white, with some slight dark points on termen.

Habitat.—CEYLON. *Exp.* 12 mill.

4542. *a.* STEMMATOPHORA OLIVALIS, Hmpsn. A. M. N. H. (7), xvii, p. 261 (1906).

♂. Head, thorax and abdomen olive-yellow, the last irrorated with a few dark scales. Forewing olive-yellow with slight dark irroration; traces of a sinuous antemedial line; a black discoidal point; some black specks on medial part of costa; the postmedial line placed towards termen, slight, dark, somewhat excurved at middle and narrowly defined by olive on outer side; the terminal area purple-red irrorated with black; cilia with fine pale line at base followed by a black line. Hindwing purple-red irrorated with black; a curved sub basal black line defined by whitish on inner side; the medial line defined by whitish on outer side, oblique from costa to submedian fold, then sinuous; cilia with fine pale line at base followed by a black line.

Habitat.—CEYLON, Haldamulla. *Exp.* 20 mill.

4546. *b.* STEMMAPOPHORA SCOTALIS, Hmpsn., A. M. N. H. (7), xvii, p. 262 (1906).

♂. Head, thorax and abdomen fuscous black mixed with some grey; tarsi tinged with white. Forewing grey, almost wholly suffused and thickly irrorated with black; the medial area darker with some pale points on costa; antemedial line pale, defined by black on outer side, bisinuate; a black discoidal spot; postmedial line pale, defined by black on inner side, slightly angled inwards below costa and at submedian fold; a terminal series of black points. Hindwing fuscous with a fine pale line at base of cilia.

The specimen from Kashmir is browner and less black, the lines of forewing closer together, and the antemedial line more sinuous.

Habitat.—KASHMIR, Goorais Valley; PUNJAB, Kangra Valley, 4,500′. *Exp.* 22—24 mill.

4546. *c.* STEMMATOPHORA FULIGINALIS, Hmpsn., A. M. N. H. (7), xvii, p. 263 (1906).

♀. Sooty black: head dull rufous; palpi ochreous white; fore coxæ with some pale scales at extremity; mid tarsi and hind tarsi except basal joint ochreous white; abdomen with slight pale segmental rings. Forewing with the antemedial line represented by a whitish point in submedian fold, with traces of a pale line from it to inner margin; the postmedial line whitish, excurved and almost obsolete between veins 7 and 2, and with a more prominent small spot in submedian fold. Hindwing with the base of costal area greyish; an obliquely curved whitish antemedial line, waved and stronger on inner area; postmedial line whitish, curved, obsolescent on costal half, strong and waved on inner half, bent inwards to inner margin.

Habitat.—BENGAL, Calcutta. *Exp.* 30 mill.

4558. *a.* HERCULIA FLAMMEALIS, Hmpsn., A. M. N. H. (7), xvii, p. 263 (1906).

♀ Fiery red; tarsi whitish. Forewing slightly irrorated with deeper red; a straight, erect, whitish antemedial line defined by deep red on outer side; some white points on medial part of costa and a faint deep red discoidal spot; postmedial line whitish, defined by deep red on inner side, slightly excurved at middle; a fine pale line at base of cilia. Hindwing rather paler; an obliquely curved whitish postmedial line; a fine pale line at base of cilia.

Habitat.—MADRAS, Bellary, Ramandrug, 3,000′. *Exp.* 24 mill.

4575. *a.* TRIPHASSA MACRARTHRALIS, n. sp. (Plate E., f. 32).

Antennæ of male with the basal joint elongate and dilated, the base of shaft curved.

Head and thorax reddish brown mixed with grey; legs fuscous; abdomen grey-brown irrorated with black and with dorsal black band at base. Forewing grey irrorated with brown and fuscous, the basal area suffused with rufous to the whitish antemedial line which is excurved from costa to median nervure; the medial area with some pale points on costa; an indistinct dark discoidal spot; postmedial line whitish, excurved from costa to vein 4, incurved to submedian fold, then again excurved, some red-brown suffusion before it at middle and beyond it from costa to submedian fold; a terminal series of small black spots; cilia with white line at base followed by a dark line and grey and fuscous tips. Hindwing greyish suffused with red-brown and with slight dark irroration; an indistinct pale curved postmedial line; cilia whitish with dark line near base and dark tips.

Habitat.—CEYLON, Eppawela (Green.) *Exp.* 20 mill. Type in B.M.

4579. *b.* HYBOLOMA PALLIDALIS, Hmpsn, A. M. N. H. (7), xvii, p. 265 (1906).

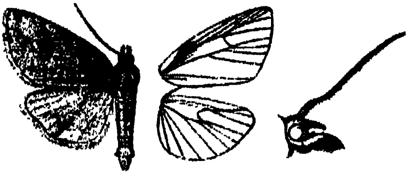
♀. Head and thorax pale rufous; abdomen grey tinged with pale, rufous at base and irrorated with black. Forewing pale rufous slightly irrorated with black, the terminal area somewhat deeper rufous; a small rather diffused black discoidal spot, and two obliquely placed postmedial points below costa. Hindwing pale ochreous, the terminal area tinged with rufous.

Habitat.—BURMA, Karen Hills, Thandsung. *Exp.* 22 mill.

Genus, LOPHOPALPIA. Type.

Lophopalpia, Hmpsn. Trans. Ent. Soc., 1896, p. 526 ... ... *pauperalis.*

Palpi porrect, extending about the length of head, the 2nd joint fringed with long hair below extending to end of 3rd joint, which is bent sharply down at an angle; maxillary palpi filiform; proboscis minute; frons with a sharp tuft; antennæ of male ciliated; tibiæ fringed with hair on outer side; claspers and anal tuft large. Forewing with the costa arched at base, then nearly straight; male with a glandular swelling at base of costa below, fringed with long hair; vein 3 from near angle of cell; 4·5 from angle; 6 from upper angle; 7·8·9·10 stalked; 11 from cell. Hindwing with vein 3 from near angle of cell; 4·5 from angle; 6·7 shortly stalked; 7 anastomosing with 8.



Lophopalpia pauperalis. ♂ $\frac{2}{1}$

4579. *f.* LOPHOPALPIA PAUPERALIS, Leech. Entom. xxii, p. 70, pl. iv, f. 11 (1889).

Head and tegulæ red-brown; patagia and thorax dark brown with a leaden gloss; abdomen ochreous grey, dorsally suffused with dark-brown. Forewing glossy rufous with some dark irroration and striation, the area below the cell and vein 4 greyer; traces of an erect antemedial line; postmedial line rather diffused, incurved from costa to submedian fold, then excurved, the rufous on its outer side running down to a point at submedian fold; a deep rufous terminal line; cilia rufous, greyish towards tornus. Hindwing pale silky ochreous with some dark irroration and striation between the cell and the vein 4 and submedian fold; a fine deep rufous terminal line; cilia with slight brown line near base; the underside pale ochreous, the costa tinged with rufous, a faint curved postmedial line.

Habitat.—JAPAN; ASSAM, Khasis; PULO LAUT. *Exp.* 26 mill.

4595. *b.* PARACTENIA DESERTALIS, n. sp. (Plate E, f. 31.)

Antennæ of male ciliated; forewing with vein 7 from beyond 9.

♂ Head, thorax and forewing pale ochreous; abdomen and hindwing ochreous white; fore tibiæ at extremity and tarsi tinged with fuscous; pectus; coxæ and base of abdomen below tinged with pale pink.

♀. Forewing with slight fuscous discoidal spot, the medial part of costa with series of slight dark streaks, traces of a pale postmedial line oblique below vein 4.

Habitat.—BELOOCHISTAN, Quetta (Nurse). *Exp.* 14-20 mill. Type in B. M.

4601. BOSTRA *marginata*, insert *Arripana* INDICATOR, Wlk. Journ. Linn Soc. vii, p. 74 (1864), which has precedence.

THE MOTHS OF INDIA (HAMPSON).

DESCRIPTION OF PLATE E.

WHICH APPEARED IN NO. 1, VOL. XVIII, PAGE 44.

Fig.	1.	*Epiplema polei.*
,,	2.	*Epiplema subflavida.*
,,	3.	*Dirades nubila.*
,,	4.	*Hypochrosis hypoleuca.*
,,	5.	*Boarmia miocrota.*
,,	6.	*Phibalapteryx rufipalpis.*
,,	7.	*Sauris metaphæa.*
,,	8.	*Eupithecia albifurva.*
,,	9.	*Neoscelis metachlora.*
,,	10.	*Crambus dianiphalis.*
,,	11.	*Platytes acroperalis.*
,,	12.	*Euzophera cocciphaga.*
,,	13.	*Euzopherodes albistrigella.*
,,	14.	*Entephria hypostictalis.*
,,	15.	*Oligostigma alicialis.*
,,	16.	*Sufetula nitidalis.*
,,	17.	*Phlyctænodes leuconeuralis.*
,,	18.	*Abraxas poliostrota.*
,,	19.	*Euzophera ectophæa.*
,,	20.	*Spatulipalpia hæmaphoralis.*
,,	21.	*Phycita definalis.*
,,	22.	*Rhodophæa albirenalis.*
,,	23.	*Abraxas argyrosticta.*
Fig.	24.	*Pseudoterpna neonoma.*
,,	25.	*Entephria stictalis.*
,,	26.	*Calamochrous purpuralis.*
,,	27.	*Nacoleia tumidicostalis.*
,,	28.	*Pionea scopicalis.*
,,	29.	*Abraxas latizonata.*
,,	30.	*Patissa intersticalis.*
,,	31.	*Paractenia desertalis.*
,,	32.	*Triphassa macrarthralis.*
,,	33.	*Phycita endomelæna.*
,,	34.	*Tegostoma trophotalis.*
,,	35.	*Cybolomia cervinalis.*
,,	36.	*Nacoleia nigricostalis.*
,,	37.	*Calamochrous sarcalis.*
,,	38.	*Melissoblaptes vinotincta.*
,,	39.	*Acidalia phœnicearia.*
,,	40.	*Dysethia glaucofusa.*
,,	41.	*Euchloris albidentula.*
,,	42.	*Hypephyra cyanosticta.*
,,	43.	*Cidaria scotaria.*
,,	44.	*Filodes bilinealis.*
,,	45.	*Phryganodes chrysalis.*
,,	46.	*Lygropia shevaroyalis.*

(To be continued.)

TWO NEW SNAKES FROM ASSAM.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

(WITH A PLATE.)

(*Read before the Bombay Natural History Society on the 25th July* 1907.)

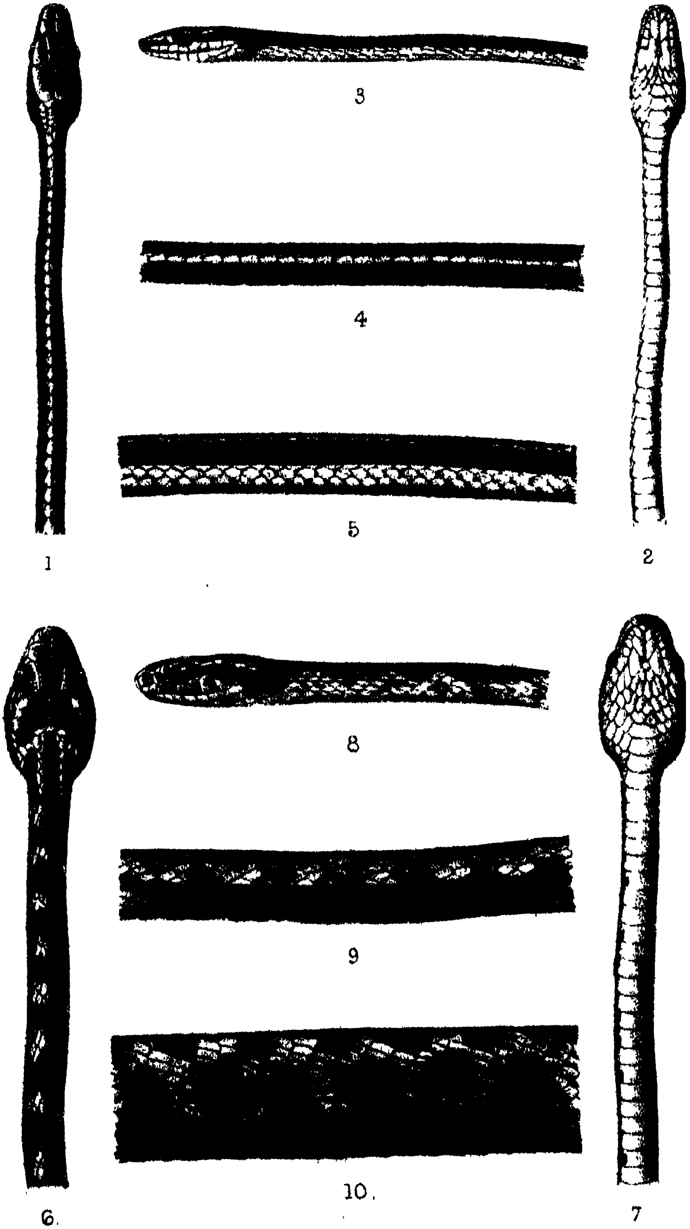
Within a month I have had the good fortune to acquire two snakes new to science.

The first was one of four snakes which had been preserved in spirit some years, and stowed away as rubbish in a godown. My written appeal for snakes in the Dibrugarh Club brought these specimens back to recollection. The habitat is almost certainly Tinsukia.

Dipsadomorphus quincunciatus.

This snake is a very typical *Dipsadomorphus* but differs from all others previously described. The divided anal shield alone will distinguish it from all the other known Indian species.

Description.—Rostral: Touches six shields, the sutures made with the anterior nasals being one-fourth longer than those made with the internasals. *Internasals:* Two; suture between them three-fourths that between the præfrontal fellows; two-thirds the internaso-præfrontal suture. *Præfrontals:* Two; the suture between them subequal to the præfronto-frontal; in contact with internasal, postnasal, loreal, præocular, supraocular, and frontal. *Frontal:* Touches six shields, the fronto-supraocular sutures being about one-fourth longer than the rest. *Supraoculars:* Length equal to breadth; from half to two-thirds that of the frontal. *Nasals:* Two subequal shields, touching the 1st and 2nd supralabials. *Loreal:* One; rather higher than long. *Præocular:* One, barely reaching crown. *Postoculars:* Two. *Temporals:* Small scale-like; two superposed anteriorly. *Supralabials:* Eight on the right side, with the 3rd, 4th and 5th touching the eye. Nine on the left side with the 4th, 5th and 6th touching the eye. *Posterior sublinguals:* Greater than anterior; in contact with the 5th, 6th and 7th infralabials; in contact with one another in front. *Infralabials:* The 7th is the largest of the series, is rather broader than the posterior sublinguals, and in contact with 3 scales behind. *Costals:* Two heads-lengths behind head 19, mid-body 19, 2 heads-lengths before vent 15. In the step from 19 to 17 the uppermost row is absorbed into the vertebral; from 17 to 15 the



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TWO NEW SNAKES FROM ASSAM.

1-5. Dendrelaphis biloreatus. 6-10. Dipsadomorphus quincunciatus.

3rd and 4th above the ventrals coalesce. Vertebrals moderately enlarged ; the last row barely enlarged. *Ventrals :* 242. *Anal :* Divided *Subcaudals :* 118, divided. *Colour :* Yellowish with darkish brown vertebral short crossbars, and a costal series of similar bars alternating with the vertebral on each side. Belly obscurely mottled specially behind. Head mottled brown, a conspicuous postocular streak, and a V on the crown, the arms of which meet the postocular streak, and three occipito-nuchal streaks. *Length :* Between two and three feet. The anterior palatine teeth are not enlarged.

Dendrelaphis biloreatus.

This very graceful little snake was acquired at Sadiya on the Bramaputra 70 odd miles north-east of Dibrugarh.

It is 2 feet 3½ inches long, and the tail accounts for 9¼ inches.

Description.—Rostral : Touches six shields, the internasals and anterior nasals making subequal sutures, which are rather longer than the first labials. *Internasals :* Two, the suture between them three-fourths that between the præfrontal fellows ; and three-fourths the internaso-præfrontal sutures. *Præfrontals :* Two, the suture between them one-third to one-fourth greater than the præfronto-frontal suture ; in contact with internasal, postnasal, two loreals, præocular, supraocular, and frontal. *Frontal :* Touches six shields, the sutures with the supraoculars are very long, more than twice that made with the parietals. *Supraoculars :* Breadth and length subequal to that of the frontal. *Nasals :* Touch the 1st and 2nd supralabials, the anterior is rather longer than the posterior. *Loreals :* Two (1 + 1), the anterior rather the shorter. *Præocular :* One. *Postoculars :* Two. *Temporals :* 1 + 1 + 2. *Supralabials :* 9, the 4th, 5th and 6th touching the eye. *Posterior sublinguals :* Longer than the anterior ; quite separated ; in contact with the 5th, 6th and 7th infralabials. *Infralabials :* The 7th is the largest of the series, more than twice the length of the 6th ; broader than the posterior sublinguals, and in contact with two scales behind. *Costals :* Two heads-lengths behind the head, 13 ; midbody, 13 ; two heads-lengths before the vent 9. In the step from 13 to 11 the 5th row above the ventrals disappears, in the next step from 11 to 9 the 4th and 5th rows above the ventrals coalesce. Vertebrals much enlarged, larger than the last row ; last row enlarged. *Ventrals* : 192, keeled. *Anal :* Divided. *Subcaudals* : 147, divided, keeled. *Colour :* Dorsally bronze-brown, rather lighter vertebrally in forebody. A pale line runs along the last row and lower half of penultimate ending at the vent. The overlapped portions of the scales, especially in the anterior part, are bright blue as in *Dendrophis pictus.* The head is bronze-brown above with a black loreal streak, continued through the temporals to the forebody where it fades, and is lost. Lips creamy white, the upper tinged greenish posteriorly. *Maxillary teeth* about 21, the posterior not enlarged. In colour the snake is extremely like *Dendrophis pictus* in every detail.

It appears to me to be most like *D. caudolineolatus,* from which it differs in having two loreals, three labials touching the eye, and in the excessive number of ventrals and subcaudals.

ADDITIONAL CUCKOO NOTES.

BY

E. C. STUART BAKER, F.Z.S.

(*Continued from page 894 of Volume XVII.*)

The year 1907 has added two important items to our knowledge of cuckoo oology. The most important of these two is, perhaps, the obtaining, by Major H. A. F. Magrath, of an oviduct blue egg of *Cuculus canorus*, the Common Cuckoo.

The first egg obtained was forwarded to me through a friend with the following letter :—

" I am sending you a cuckoo's egg, taken by me on the 1st June, from the nest of *Oreicola ferrea* (The Dark-grey Bush-Chat) in Thandiani, on the top of the hill.

"The egg is interesting for the following reasons :—The only cuckoo which occurs, as far as I can see, up here, is *C. canorus*, and it is so common as to be almost a nuisance. *C. saturatus* also occurs, but lower down. Although Thandiani ridge is only 40 miles from Murree, yet it is due north of it, and is isolated from the ridge on which the Gallis are situated. I think, therefore, that it is very probably outside of the range of the subtropical cuckoos. If any of the other cuckoos occurred I should surely have heard of them, and as you know, I spend my days up here after birds. I am well acquainted with the 'Kaphul Pakkha' notes of the *micropterus* which one hears all round Mussoorie, the brain fever notes of *Hierococcyx*, and the notes of *Coccystes jacobinus*. For all of them have I listened intently, therefore I think we can eliminate these three birds. *Surniculus lugubris* may occur ; but I have never heard their call, and from the size of the egg I think we can eliminate him.

"There remains *C. poliocephalus*, *Cac. passerinus*, *C. saturatus*, and *C. canorus*. The first two, as I have said before, I have neither seen nor heard, and I have been pretty well all over the ridge. The 'up poop, poop, poop, poop' of No. 3 is heard pretty freely from 7,000′ down, and I once got close to a bird which was calling at about 8,000′.

" Up here, then, which is between 9,000′ and 10,000′, *canorus* has it pretty well her own way ; both she and the common foster parent of her eggs, *Oreicola ferrea*, are very common.

"The nest contained three eggs of *O. ferrea* besides the cuckoos, and was a fairly open one in the cleft of a rock. Two days later I found it rifled, possibly by a jay or a magpie (*Urocissa flavirostris*).

"Another nest of *O. ferrea*, which I found close by, contained no cuckoo's eggs, probably because it was so admirably concealed.

"I have been hanging about with a gun in the vicinity of these nests, hoping to get a female cuckoo, but although the females of *canorus* have been flying about, further up the hill on both sides, none have as yet come into the actual vicinity of the nests.

"*Trochalopterum lineatum* nests all over the top of the hill, and I have examined eggs in several nests, but found no cuckoo's eggs."

This letter was written on the 5th June, and was promptly followed by one on the 17th, telling me how the riddle of the blue egg had been solved.

In this second letter, Major Magrath writes :—

"Some two or three weeks ago, I sent you a blue cuckoo's egg, taken in the nest of *Oreicola ferrea.*

"I have now to report a more important find, which will interest you, and which has, I think, at last put the question of a blue egg of *canorus* beyond doubt.

"After finding the first cuckoo's egg (blue) in the nest of *O. ferrea*, I hunted up other nests and have so far found six of this species. None of the remaining five contained cuckoo's eggs; but one contained a young cuckoo, which was, I think, *canorus.* This young bird came to grief in a storm a day or two later. I then turned my attention to the nests of *Larvivora brunnea*, a common species up here. They are such skulkers, and the females so difficult to observe, that I have only succeeded, so far, in getting two nests.

"In nest No. 2, *L. brunnea*, I found the blue cuckoo's egg now sent you and which was pretty well incubated.

"As I wrote before, the only cuckoos which occur here, to my knowledge, are *canorus* and *saturatus.*

"On June 6th, I did certainly hear a solitary *Hierococcyx sparverioides* about three miles along the ridge of the south of this; but this bird was probably a solitary straggler, as I have not since heard the notes of this species. If any other cuckoos and especially *micropterus* occurred, I should surely have heard them. I have been pretty well all over this hill, and you know how plainly and how far one can hear in these deep still valleys. I had my suspicion, therefore, that *canorus* was the layer of the blue egg (the bird being so very common here). All this time I was endeavouring to solve the enigma by shooting a female and examining the oviduct egg; but although I could have shot plenty of males, I found the ladies exceedingly difficult of approach. Luckily I happened to stumble on a favourite cuckoo feeding ground in a patch of dock weeds full of hairy caterpillars. Here, on the morning of June 15th last, I took my stand with my gun, but without success. However, visiting the place again in the evening I was more successful, and, out of 4 cuckoos feeding and flying about there, managed to select and knock over the female, the skin of which I now send you, and from the oviduct of which I took the fragments of blue eggshell also sent. I hope there is no mistake about my identification. I do not think there is.

"The egg was unfortunately broken, either in the fall when shot, or possibly by my injudicious handling in order to put the poor bird, which was only winged, out of its misery. This example was shot within 300 yards of the nest of *L. brunnea*, from which the blue egg was taken, and in my own mind I have little doubt that this is an egg of *canorus*. I am also of opinion, perhaps a rash one, that *canorus* lays *mostly* blue eggs on this hill."

It is very curious, that prior to receiving this letter, which most effectually disposed of all my previous doubts as to the Common Cuckoo laying blue eggs, I had myself found three blue cuckoo's eggs, which had made me feel that I had been much too emphatic in my assertions on this point.

Three blue eggs taken by me this year, two in the nests of *Liothrix lutea* and one in that of *Mesia argentauris*, were found at an altitude of 5,000 feet, at which, in the Shillong Hills, only two cuckoos breed: namely *canorus* and *saturatus*. As my eggs could not have been those of *saturatus*, they were bound to be those of the Common Cuckoo, and I was just about to *climb* down gracefully from my pedestal of "no blue *canorus*-eggs" when Major Magrath's letters came and *hurled* me headlong from it.

These eggs require no description, as they answer in every single respect to those I have already described as belonging to our Indian Cuckoo, *micropterus*.

One of Major Magrath's eggs is spotted with three or four tiny specks and spots of darker green blue and the other is unspotted; all mine are pure blue.

I would wish to note that I still consider that Col. Rattray's eggs did really belong to *C. micropterus* and there is need to think, that, because *canorus* lays blue eggs, *micropterus* does not do the same.

Colonel Rattray's and my processes of elimination will, I believe, still lead most people to consider that many of his eggs must have been of the latter species.

The second important piece of knowledge acquired this year, is through Mr. A. M. Primrose. It will be remembered that Mr. Primrose sent me a certain remarkable cuckoo's egg which he had found in the nests of *Aethopyga seheriæ*. In compliance with my earnest request, he, this year, paid very especial attention to this matter, and has succeeded in rearing a young cuckoo from the nest, which turns out to be a lovely young Emerald Cuckoo (*Chrysococcyx maculatus*).

These eggs are, therefore, satisfactorily accounted for; but the find is not only a most notable one, on account of what it demonstrates in this respect, but it is also almost equally so in that it knocks the whole of my theories concerning the eggs of both the Emerald Cuckoos and the Violet Cuckoo to the ground.

As already recorded, on one occasion, one of these little cuckoos was caught by my men in a nest containing one of the pink eggs described by me as probably belonging to the bird; but these pink eggs must now be admitted to be those of some other cuckoo.

It does not matter that the colours are different, but it does matter that size, shape and texture are totally different.

What my eggs are, I cannot say, they are not those of the Emerald Cuckoo, and I do not think they can be those of the Violet Cuckoo, which can hardly vary so tremendously in every particular from those of the former.

They may, of course, be those of *Penthoceryx* from the oviduct egg of which they can hardly be distinguished, but—it is a very big but—*P. sonnerati* was very rare in N. Cachar, yet the eggs taken were comparatively numerous.

I trust my own utter collapse over the Emerald Cuckoo's eggs will prove an ample excuse to my friends, whose evidence *re* cuckoo's eggs I have not deemed conclusive.

I have taken very numerous eggs of *Cacomantis merulinus* this year, in three cases catching the cuckoo by nooses on the nest. Their eggs call for no special remark except that, strange to say, they average smaller than those of *passerinus*. They lay principally in the nest of *Orthotomus* and *Cistecola*.

ON SOME INDIAN FORMS OF THE GENUS *MICROMYS.*

BY

R. C. WROUGHTON.

Though the name *Micromys* was proposed so long ago as 1841, it was not generally accepted until quite recently. In 1905, Mr. Thomas (A.M.N.H., May 1905, p. 492) in describing a Japanese form adopted the name for the group of Field Mice, of which the European representatives are *minutus*, *sylvaticus**, *agrarius* and *mystacinus*. He (loc. cit.) recapitulates the chief characteristics of the Genus as follows :—" the posterior laminæ of the first and second " upper molars have each an additional internal cusp beyond the " number present in *Mus ;* so that, counting along the inner side of " the tooth-row, there are three cusps on the first molar and three on " the second, while in *Mus* the posterior lamina is not continued in- " wards beyond the centre, and there are therefore only two inner " cusps on each of the two teeth."

Distinct local forms of *Micromys sylvaticus* occur at intervals over the whole area between its typical home in Europe and Ispahan the type locality of *Mus arianus* Blanford, and there can be scarcely any doubt that that animal should rank as a subspecies of *M. sylvaticus* and not as a distinct species. I propose to treat the Indian forms, with which these notes are concerned, also as subspecies of *M. sylvaticus*. The mammary formula as in "*Mus arianus*" and typical *M. sylvaticus* is 1—2=6.

In 1876, Blanford described and figured a form from Persia (Zoology of Persia, p. 54) under the name *Mus erythronotus*, which he afterwards (that name being preoccupied) changed (A. M. N. H., vii. 1881, p. 162) to *Mus arianus*. In his "Mammalia" Blanford claims that this form extends into the Indian Region at Gilgit. It seems to me most improbable that a species so variable as *M. sylvaticus* should remain unchanged from Ispahan to Gilgit across the whole breadth of Persia and Afghanistan, and I should expect rather to find at Gilgit either True's subspecies *griseus* or more likely, either *wardi* or a closely related subspecies.

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* This is the Long-tailed Field Mouse, a common animal all over the British Isles, requently doing much damage to crocus bulbs in the spring.—EDS.

The material available for examination is very limited; except two series from Kashmir and Ladak sent by Col. Ward and some specimens from the Panjab collected and presented by Majors Dunn, R.A.M.C., and Magrath, I can find no Indian specimens in the Museum Collection. Mr. Thomas has recently described several species of *Micromys* from China and Japan, and a form was described from Eastern Thibet more than 20 years ago. It is to be expected the genus will be found to be represented at all our Himalayan hill stations. It would be most interesting to see if and to what extent the species varies as it passes Eastward, for the Japanese and Chinese forms are specifically distinct from *M. sylvaticus*, and have their mammary formula 2—2=8. Wherever it occurs, it is likely to be very common, and I would appeal to members of the Society, who may have the opportunity, to collect and send in series of specimens.

Key to the known Indian Races of *M. sylvaticus.*

A. Tail as long as head and body or slightly longer.
  a. Larger; colour ochraceous-brown (Kashmir)... *griseus* True.
  b. Smaller; colour drab...(Ladak and Skardo).. *wardi* subsp. n.
B. Tail shorter than head and body (Panjab)......*pentax* subsp. n.

Micromys sylvaticus griseus. Tr.

1894. *Mus arianus griseus* True. Proc. U.S. Nat. Mus., xvii., p. 8.

True distinguishes his subspecies *griseus* from *Mus arianus* by its "having the upper surfaces ochraceous grey instead of rufous." He gives "Central Kashmir and the Pir Panjal" as type localities of his subspecies. Col. Ward has collected a long series from several places in the Kashmir Valley, and they almost certainly represent True's *griseus*. They are a very even series, showing little individual variation. General colour "wood-brown"; each hair slate grey for ¾ its length then buff, in a certain proportion of hairs (large on the back, small on the flanks) the buff is reduced to a mere ring by a long black tip. Belly white, the hairs with slate-coloured bases. Hands and feet white. Tail like back above, white below.

Dimensions of an adult male:—

Head and body, 113 mm.; tail, 114; hind foot, 23; ear, 15.

Skull: greatest length, 30; basilar length, 24; diastema, 8·5; zygomatic breadth, 15; interorbital breadth, 4·5; brain case breadth, 13·5; palatal foramina, 6; upper molar series, 4; bullæ, 4·5.

Micromys sylvaticus wardi, subsp. n.

A pale-coloured *Micromys* rather smaller than *M. sylvaticus griseus.*

Fur fine, silky, moderately long (10—12 mm. on the back).

General colour above pale "drab", with a suffusion of "clay colour"; below white ; the line of demarcation in the flanks not very distinctly defined. Individual hairs of the back slate colour basally for ¾ their length then "cream-buff" ; on the back pale terminal portion reduced to a subterminal ring by a long black tip on a large proportion of the hairs, towards the flanks these black-tipped hairs much sparser or entirely absent ; individual hairs of belly slate colour with white tips. Face coloured like back. Tail like back above, below white. Hands and feet white.

Skull short and broad ; shorter than in *griseus*, but almost equally broad in all measurements. Palatal foramina much shorter.

Dimensions of the type :—

Head and body, 100 mm. ; tail, 104 ; hindfoot, 21 ; ear, 16.

Skull : greatest length, 27 ; basilar length, 21·5 ; diastema, 7·5 ; zygomatic breadth, 14·5; interorbital breadth, 4·5 ; brain case breadth, 13 ; palatal foramina, 5 ; upper molar series, 4 ; bullæ, 4·5.

Habitat : Ladakh. Alt. 9,000′—11,500′. Type from Saspul.

Type : Old male. B. M. No. 7.12.16.2. Original number 431. Collected by Colonel Ward on 3rd June 1905.

This differs from any other form of *M. sylvaticus* that I have seen, by its drab colour contrasting strongly with the various mixtures of ochraceous and brown in different proportions which characterise all the other races. A specimen collected by Mr. Whitehead at Skardo is identical with Col. Ward's series from Ladakh.

I have much pleasure in naming this well marked race after Col. Ward, to whose energy and liberality the National Collection owes the series on which it is based.

Micromys sylvaticus pentax, subsp. n.

A short tailed race of *M. sylvaticus.*

Size rather smaller than *M. sylvaticus griseus.*

Fur soft, rather short (6—8 mm. on the back).

General colour very much as in the Kashmir form, but a distinct tendency to show a darkened area on the back and rump, especially noticeable in the younger specimens. All details of colour as in *M. sylvaticus griseus.*

Skull in size as in *M. sylvaticus wardi*, but narrower in all details, especially noticeable in the portion in front of the orbits. Palatal foramina rather longer.

Dimensions of the type :—

Head and body, 102 mm. ; tail, 92 ; hind foot, 21 ; ear, 15.

Skull : greatest length, 27 ; basilar length, 22 ; diastema, 7·5 ; zygomatic breadth, 13·5 ; interorbital breadth, 4 ; brain case breadth, 12 ; palatal foramina, 5·5 ; upper molar series, 4 ; bullæ, 4·5.

Habitat : Panjab. Type from Thandiani.

Type : Old male, B. M. No. 7. 8. 1. 4. Original number 3. Collected 31st May 1907, and presented to the Natural History Museum by Major H. A. F. Magrath.

A series of four specimens—two males and two females—were taken by Major Magrath in the Hazara District. Four others were obtained by Major Dunn, R.A.M.C., at Gharial, near Murree. These were all males and younger. Throughout the two series the short tail and narrow skull are constant characteristics.

NOTES ON THE BIRDS OF THANDIANI.

BY

MAJOR H. A. F. MAGRATH.

Thandiani in the Hazara District, N. W. F. P., is, as its name mplies, a delightfully cool little hill station in summer. It is situated 14 miles N.-E. of the Military cantonment of Abbottabad, on the summit of a ridge, the highest point of which is just over 9,000 feet. This ridge runs parallel, but in echelon, to the ridge on which the Galis lie. From 6,000 feet up it is covered with dense forest, consisting for the most part of Silver pine, Blue pine, yew trees, horse chestnut, walnut, sycamore, and wild cherry trees. There is also a dense undergrowth of *Daphne oleoides* and a species of *Strobilanthes.* Where the sunlight can get at the hill sides they are carpeted with wild flowers in spring, such as anemones of two or three kinds, wild violets, wild strawberries, kingcups, etc., also ferns of three or four kinds, among which the maidenhair is common. The forests thin out as one approaches the top of the ridge, which in places is bare of trees but covered with grassy turf. The hill stations of Nathia Gali, Dunga Gali and Murree are respectively about 10, 14, and 25 miles due south as the crow flies, and it is a curious fact that although so close together the avifauna of Thandiani, compared with that of Murree and the Galis, should be so much poorer in species. The ridge on which Thandiani stands appears to be just outside the range of many subtropical species common in the Murree hills, thus proving that the range of a species is often sharply defined. In the present case it is hard to understand why this should be as the flora of both localities is very similar, and if anything the forests round Thandiani are denser and of greater variety than those round Murree and the Galis. As an example I will mention one species only which is quite common in the Murree hills and also I believe in the Galis, but which, as far as I am aware, does not occur in Thandiani, *viz.*, "*Megalæma marshallorum.*" On the other hand I believe that all the species which occur in Thandiani are common to Murree and the Galis. The area covered by my observations is limited to a horizontal distance of 5 or 6 miles along the top of the ridge, to the lower tree limit on the east side of the ridge and on the west to the top of the ridge of the outer range of hills between which and the main ridge the Kala Pani stream flows. To include more of the range of hills on which Thandiani stands would be unduly stretching the bird area which could be legitimately called Thandiani. I must acknowledge my indebtedness to a simple list of the birds of the Murree hills and the Galis given me by a friend who compiled it from "Birds nesting in the Murree Hills and Gallies" by Colonel Rattray published in Vol. XVI, Nos. 3 and 4 of this Journal, which aided me considerably in my identifications. I made no collection and am averse to collecting birds, unless with some special object, in the breeding season. None of my identifications therefore were from skins. My notes only cover a period extending from 20th May to 10th July, but it is just in this short period that birds are best observed. The numbers and nomenclature are in accordance with the "Fauna of British India."

(4). *Corvus macrorhynchus.*—The Jungle Crow is a common summer visitor and breeds freely along the Thandiani ridge. The nest is generally built in a pine tree at a considerable height from the ground and is of the usual crow type. I did not take any eggs, but was informed by hillmen that the young are hatched about the middle of June. The depredations committed by these crows on the eggs and young of smaller birds are extensive and a large part of their daily food in the breeding season is thus obtained. Amusing gurgles and croaks are indulged in by the jungle crow as he sits in the heat of the day on a shady bough, which make one think that he would be easy to train to talk. In the winter he migrates far into the plains.

(13). *Urocissa flavirostris.*—The Yellow-billed Blue Magpie is often seen and heard in the dense forests along the ridge. Fledglings, being fed by their parents, are to be seen from the beginning of June. The habits of this magpie are no exception to those of the rest of the family and it lives in the breeding season by harrying the nests of other birds.

(24). *Garrulus lanceolatus.*—It is not difficult to observe the Black-throated Jay in the forests between 6,000 and 8,000 feet. Eggs freshly taken were shown me in the middle of June. The note is harsh and jay-like.

(26). *Garrulus bispecularis.*—The Himalayan Jay is rather rare and I only once set eyes on a pair. In a tree they remind one very much of the British Jay. They breed at about 7,000 feet and the eggs are very similar to those of the last species.

(28). *Nucifraga multipunctata.*—For about ten days in the middle of June the harsh chatter of the larger spotted Nutcracker was constantly heard towards evening. Though rather shy I once got a close view of this bird by concealing myself in bushes on the side of a hill, the bird being very high up in a pine, the top of which was level with me. I am inclined to believe they had just arrived at this time and subsequently started nesting operations somewhere on the hill. I did not find a nest.

(31). *Parus atriceps.*—The Indian Grey Tit is not uncommon at about 6,000 feet.

A pair nested in a hole between the lintel of the bathroom door and the masonry in the Dâk Bungalow at Kala Pani and were carrying food to the young on 10th July.

(34). *Parus monticola.*—From 7,000 to 8,000 feet the Green-backed Tit is fairly common. I saw several nest holes that were occupied by these Tits. They appear to prefer dead trees for their nests, and usually sycamores. The nest holes are generally natural holes in knots in the trees. Young were going about by the end of June. The note is a pretty metallic sounding Tēe-tēe.

(35). *Ægithaliscus erythrocephalus.*—The beautiful little Red-headed Tit is rare in Thandiani and I only once saw an example.

(42). *Machlolophus xanthogenys.*—I cannot say I saw this species to be absolutely certain of it; but a party of Tits observed one day in the pines some way off on a khud side, looked liked Yellow-cheeked Tits. A very rare bird in Thandiani.

(44). *Lophophanes elanolophus.*—The lively little Crested Black Tit is one of the commonest birds on the hill. The nest hole, which is generally in a natural hole of a tree, is often within a foot of the ground and always in a living tree. The eggs are laid as early as the end of April and by the beginning of June family parties are everywhere in evidence. A curious hissing or spitting noise, alarmingly loud for such a tiny atom of a bird, is emitted from the nest-hole if one puts one's hand inside the entrance. A leaf or a little bit of twig dropped into the hole speedily brings the indignant occupant to the entrance with the offending morsel in its bill. But, strange to say, crumbs of cake or little grubs thrown in fail to bring him or her forth ! A variety of song notes are given by this little Tit, a common one being Chăk-chă-bīnh or Kīnk-kă-jōu." The call note is " tĕ-tēwy̆."

(91). *Trochalopterum simile.*—Another very common bird is the Western Variegated Laughing Thrush, so called, though he really belongs to the babbler family. For such a large bird and such a common one it is extraordinary how seldom one sets eyes on him. He is a skulker and loves to get into the middle of a thick bush and start off with his loud whistle Zdrīp-Dīu-ī-wīuh" or "Dīo-pī-wiah" (the " i " pronounced as " ee") often indeed well represented by the words " choky william," which is immediately taken up by hidden accomplices in the bushes around. The breeding season is May and June and the nest which is built of coarse grass and stems, is generally placed in the bough of a yew about ten or twelve feet from the ground, sometimes in a bush. The ground colour of the eggs is a beautiful green blue.

(99). *Trochalopterum lineatum.*—Another skulker, the Himalayan Streaked Laughing Thrush, is quite as common as the last species. It hops about in small parties at the bottom of bushes with a sort of " churring" note. At the beginning of the breeding season it has two whistling notes of " Trīt-tēw" and " Tēwīt" and another note of " Jŭ-wī-y̆e." The eggs are laid in May and June and the nest, which is built of grass, is generally placed low down in a fork of a yew tree. I have come across other nesting sites in small bushes in a hollow in a bank and in a silver pine. The nest in the latter was a most peculiar one. First a platform of coarse grass and bents, about a foot wide and 3 or 4 inches deep, had been laid on a low spreading branch and in the middle of this was built a nest composed of the pine needles of the blue pine. The eggs are a lovely turquoise blue unspotted and the clutch is always three.

(187). *Myiophoneus temmincki.*—The Himalayan Whistling Thrush is only to be observed down hill between 5,000 and 6,000 feet on the mountain streams. I did not look for nests. The song notes are very like the whistling of a human being.

(190). *Larvivora cyanea.*—Looking for the nests of the next species I once came across a pair of birds which I have no doubt were Siberian Blue Chats. An account of the circumstances under which I happened on this rare species to India was published in the notes to Vol. XVIII, page 197 of this Journal.

(191). *Larvivora brunea.*—Though a very common bird on the hill and heard everywhere, the Indian Blue Chat is rarely seen. He is a skulker "*par excellence*," and only an occasional glimpse is to be caught of him as he hurls himself from cover to cover. At pairing time he throws off these secretive habits to a great extent and is to be seen displaying his beauty to advantage perched on a bush or branch of a tree, and uttering with open and quivering bill, and apparently much strain on his syrinx, his whistling song of "Jerri-Jerri," followed by a rapidly repeated "tică-tică-tică" or "quĭck-quĭck-quĭck." When perching in the open he has a curious habit of jerkily waving his tail 4 or 5 times from the line of the back down, every fifth or sixth wave raising it considerably higher. A good way to observe this bird is to creep quietly into, and sit down in the centre of, a clump of thick bushes which he is known to frequent. He may then be seen at quite close quarters as he hops warbling and whistling through the cover. The female, owing to her rather sombre garb and quite as unobtrusive habits, is still less easy to observe. The nest, which is built of moss and leaves, and lined with hair and a few feathers, is usually placed in the crevice of a rock or under a stone in a gully and near thick cover and is, as a rule, wonderfully well concealed. The eggs, four in number, are plain blue unspotted and not as described in the "Fauna of British India." When one approaches a nest in which there are young, the parents show their concern by uttering a peculiar "tack-tack" note very similar to the alarm note of the Stonechats and easily simulated by knocking together two small stones. After sounding this note the bill is often opened and shut several times without any sound being produced. The spirits of the male bird are irrepressible and he sings even when the brood is hatched and his time is taken up in foraging for his young. The young leave the nest at an early age and before they can fly. This species is one of those selected by the common cuckoo as foster-parent for its young.

(226). *Zosterops palpebrosa.*—Only twice have I met with the Indian "White eye"; on both occasions in small parties hunting for insects under the leaves of the sycamore and wild cherry tree. The note is a "tsip-tsip." I did not find a nest.

(260). *Cephalopyrus flammiceps.*—The Firecap is a fairly common little bird on the hill. It appears to be an early breeder, as family parties with young fully fledged were going about by the middle of June. The habits and notes of this species are very similar to those of the last. On June 22nd I saw a nest with young situated about 25 feet from the ground in a hole in a sycamore. The parents visited the nest with food on an average every five minutes. The female apparently takes upon herself the duty of keeping the nest clean.

(269). *Hysipetes psaroides.*—The Himalayan Black Bulbul is not often seen on the top of the hill, but from 7,000 feet down it is fairly common. Eggs were shown me which were taken in the middle of June.

(284). *Molopastes leucogenys.*—The White-cheeked Bulbul occurs sparingly about the hill sides below Kala Pani.

(323). *Sitta leucopsis.*—The doll-like squeak of the White-cheeked Nuthatch is a familiar sound on the hill. This nuthatch is common and is the only species of its family in Thandiani. The eggs are laid in May and June. The nest is usually in a hole in a decayed pine or sycamore tree and the entrance is not, as far as I am aware, reduced by being mudded in.

(327). *Dicrurus ater.*—I am not sure whether the common King Crow occurs within the limits defined or not. It is fairly common just below these limits. A pair of drongos which I saw nesting in a "Kandhar" tree outside the Kala Pani dâk bungalow on 20th May were, I believe, of this species.

(328). *Dicrurus longicaudatus.*—The Ashy Drongo occurs in the forests up to about 8,000 feet and is common. A number of fully fledged young were in evidence on the outskirts of the forests above Kala Pani on 9th and 10th July The notes are very similar to those of the last species. A common one is "Drăngh-gĭp" or "gĭp-gĭp drăngh."

(341). *Certhia himalayana.*—The Himalayan Tree-creeper is common everywhere. I saw fully fledged young on July 1st. These are darker in plumage than their parents. I have several times seen this tree-creeper picking its food from the ground.

(401). *Sylvia althæa.*—Between 4,000 and 5,000 feet when climbing the hill on 20th May I saw a good many whitethroats, some of them undoubtedly the Indian. One bird was singing most exquisitely and its notes were different to those of the others; it was, I think, Hume's Lesser Whitethroat. The song may be rendered in words something as follows: "kărū-kărū-kărū, kărī-kărī-kărī, chirri-chirri-chirri, chup-chup-chup-chup, chăwāi-chăwāi-chăwāi, īh;" probably the birds nested near where I saw them.

(402). *Sylvia affinis.*—*Vide* note on last species.

(415). *Phylloscopus proregulus.*—Pallas' Willow-Warbler is common. I saw one with nesting materials in its bill on 22nd May, but could not trace it home in the thick jungle. This tiny bird has a habit of fluttering in the air below the end of a branch, when in search of food.

(422). *Acanthopneuste viridanus.*—The Greenish Willow-Warbler is rare, but I saw a party of five or six near the hill top on 20th June.

(428). *Acanthopneuste occipitalis.*—The Large Crowned-Willow-Warbler is an extremely common bird. It begins to breed about the end of May. At the pairing season the males are very combative and quarrelsome. A pair locked in deadly struggle fell at my feet one day and I almost had my hand on them before they had the sense to separate and fly away. A characteristic habit of this little bird, as it creeps about branches and shrubs is its restless waving of one wing; at the same time it is continually uttering its monotonous note of "chip-chip-chip-chip." The nests are composed of moss and leaves and are built usually far in under the roots of trees, sometimes on ledges of rock overgrown with ferns and roots, sometimes in between the stones of a wall or culvert, and of two nests I saw one was built in the rafters of a cowshed and another high up in the gable of a roof of a bungalow. The eggs are a plain dirty white. The bill of this species in the breeding season is of a dull orange yellow colour.

(434). *Cryptolopha xanthoschista.*— Hodgson's Grey-headed Flycatcher-Warbler is common about the lower limits of the forest on the west of the ridge and about the open hill sides below. This little warbler keeps a good deal to low bushes.

(458). *Suya crinigera.*—I watched a female Brown Hill-Warbler completing her nest on the hill side close to the road side above Kala Pani bungalow on 9th July. The grass purse-shaped nest which was in a clump of coarse grass and thorns had been completed and the process of lining with down was being carried out. The bird was absurdly tame, allowing me to get within three or four yards of the nest while she was at work.

(473). *Lanius vittatus.*—On 10th July I saw a Bay-backed Shrike on the top of the ridge overlooking Nawashahr village at an altitude of about 5,000 feet.

(476). *Lanius erythronotus.*—At about 5,500 feet I saw on the same date a solitary example of the Rufous-backed Shrike.

(495). *Pericrocotus brevirostris.*—Even in the breeding season the brilliantly coloured Short-billed Minivets appear to keep in parties. When travelling in search of food along the tops of the pines they are constantly using a tit-like chatter and a call note of "switswitswititätit." Possible this latter note gave rise to the name "minivet." Often they use a pretty note like "swisweet-sweet-sweet." They are common birds but I did not find a nest. This minivet leaves the hills and migrates far into the plains of the Punjab in winter.

(505). *Campophaga melanoschista.*—I saw a solitary example of the Dark-grey Cuckoo-Shrike at about 6,000 feet on 9th July.

(518). *Oriolus kundoo.*—The Indian Oriole occurs as a summer visitor below 6,000 feet. It is not common, but its far sounding mellow whistle is one of the forest sounds around Kala Pani.

(558). *Hemichelidon sibirica.*—The Sooty Flycatcher is on still hot days much in evidence about the top of the hill. His favourite perch is the top of a tall dead pine from which he launches himself into the air at the buzzing gnats around him. I did not look for nests. After rain this flycatcher takes its food a great extent from the ground and rocks.

(568). *Cyornis superciliaris.*—The handsome little White-browed Blue ycatcher is one of the familiar birds on the hill. The nesting season is May And June. The nest, a neat little cup-shaped structure of strips of bark and grass, is commonly built under a piece of projecting bark of the wild cherry tree, sycamore or chestnut. Sometimes in the hollow trunk of a tree shrub. The eggs are usually four in number.

(579). *Stoparola melanops.*—The beautiful Verditer Flycatcher is fairly common. It is less like a Flycatcher in habits than others of the family and is rarely seen to return to the perch which it has just quitted, but catches its food flying from tree to tree.

(598). *Terpsiphone paradisi.*—On July 9th I saw a female Paradise Flycatcher hawking dragon-flies near the waterfalls on the Sufed Pani stream above Kala Pani.

(608). *Pratincola caprata.*—Below 5,000 feet one meets with the Pied Bushchat. This and the next species meet at about 5,000 feet.

(610). *Pratincola maura.*—At about 5,000 feet the Indian Bushchat is common and nests freely on the bush-clad hill sides.

(615). *Oreicola ferrea.*—One of the commonest and most familiar birds on top of the hill is the Dark Grey Bushchat. When his mate is sitting on her nest, the male is invariably to be seen on top of the nearest tree flirting his tail and singing his rather pretty little song of "Tĭthĕrătū-chak-tĕw-tĭtătĭt", with variations. If one approaches their nest the parents become greatly excited perching on the nearest bushes flirting their tails and making a "geezing" noise something like the winding of a watch. The breeding season commences at the end of May. The nest is made of grass and bents, lined with a few feathers and placed under a stone, in a cleft in a rock, in a hollow in a bank and sometimes at the bottom of a tiny bush or on the ground under a bush. The eggs are usually four in number, sometimes five. Occasionally one or two eggs in a clutch are much bluer than the remainder. Owing to the stupidly open situations often selected, the nests are much harried by jungle crows, mischievous boys and egg collectors. Out of 13 nests found I think only one pair succeeded in bringing off a brood. The young apparently leave the nest at an early stage and before they can properly fly. They remain in thick cover for some days where the parents bring them food. The common cuckoo often deposits its eggs in the nests of this species.

(630). *Henicurus maculatus.*—I saw two or three examples of the Western Spotted Forktail on the Sufed Pani stream, above Kala Pani on July 9th.

(637). *Microcichla scouleri.*—The Little Forktail is fairly common on the above stream and I watched some of them for some time. Although these forktails are constantly entering the water to bathe, I did not actually see them do so (so as to wet their feathers) in search of food. They however commonly stand on boulders over which the water flows at a depth of an inch or so, picking up the insects that flow towards them. Often they make dashes under the spray of falling water and sometimes pick up their food out of a foaming rush of water by hovering just above it. One bird I watched which was constantly flying with food, in under the bank of the torrent and below where I was seated, evidently had a nest there, but I had not time to go down and search for it.

(646). *Rhyacornis fuliginosus.*—The Plumbeous Redstart is common on the above mentioned stream and that at Kala Pani. It is a very tame bird, and examples are often to be seen standing on rocks quite close to the dhobis washing clothes. This Redstart takes flies on the wing like a flycatcher. On July 9th and 10th I saw a number of fully fledged young. There is a fascination in watching the tails of these little birds, especially the white tails of the females and young. The motion is simultaneously a wag and an expansion, and I can liken it to nothing so much as the scintillations of light on water slightly disturbed. This peculiar tail motion is more marked in this genus than in the last.

(673). *Merula castanea.*—This lovely songster, the Grey-headed Ouzel, is fairly common above 7,000 feet. Below, its place is taken by the next species. The song, although not so continuous as that of the Song Thrush (*Turdus musicus*), is yet very similar and is one of the delights of the residents of Thandiani. The nest is built, as a rule, low down in a yew tree. The breeding season commences in May.

(676). *Merula boulboul.*—The Grey-winged Ouzel, a well known songster and favourite cage bird with the Kashmiris and Punjabis, is not very common and does not occur above 7,000 feet. Eggs taken in the middle of June were shewn me.

(690). *Petrophila erythrogastra.*—The Chestnut-bellied Rock-Thrush is rather rare. Like the next species, he is fond of perching on the topmost branches of a bare pine tree, but although I have watched a male bird once or twice I have never heard his song. I saw one bird hawk and catch a flying insect on the wing like a drongo.

(691). *Petrophila cinclorhyncha.*—Perhaps the commonest of the thrush family on the hill is the Blue-headed Rock-Thrush. Perched high up in a pine his pretty three-note warbling song of "Tēw-lī-dī, Tēw-lī-dī, Tēw-lī-dī, Tēw" (the Tew descending in the scale and getting louder at each repetition) is commonly sung in the mornings and afternoons. This thrush is sometimes seen floating down from the top of a high tree to a lower one with wings outstretched and singing all the time like a skylark. Eggs freshly taken were shewn me in June and I saw a nest with four nearly fledged young in it on June 17th and another on July 9th. The nests were built in crevices in rocks. The alarm note used by both parents when one approaches the nest is a "goink-goink".

(698). *Petrophila cyanus.*—The Western Blue Rock-Thrush is fairly common on the bare rocky hills below Kala Pani.

(698). *Oreocincla dauma.*—I twice saw the Small-billed Mountain-Thrush at about 7,000 feet, but I do not think it can be common. It keeps to the thick forests.

(709). *Cinclus asiaticus.*—While watching a little Forktail, a Dipper came into the field view of my glasses and perched on a boulder for some seconds, then flew away round a bend in the stream. From the coloration, which was a lightish grey spotted about the breast, I came to the conclusion the bird was a young Brown Dipper.

(741). *Pycnorhampus icteroides.*—The Black and Yellow Grosbeak is one of the common birds on the ridge, and in May his loud call note of "trékătree, trékătree, trékŭp trékŭp" resounds around. The "tre" is well represented by an ordinary whistle with a pea or circular piece of cork in it. Both male and female use the call note. The song note of the male is a pretty whistle "trĕ-trŭĭ, trĕ-trŭĭ." These grosbeaks feed on the fresh shoots of the pine and on the seeds in the cones. Often they are to be seen picking about on the ground. The breeding season commences in June. I did not look for nests.

(767). *Carduelis caniceps.*—On 20th May at about 5,000 feet I saw a pair of Himalayan Goldfinches fly past me down the hill, and on 10th July a flock of eight or nine flew past me about the same place. This species most probably breeds in the vicinity of Thandiani.

(772). *Hypacanthis spinoides.*—The Himalayan Greenfinch is rare at Thandiani. I only once succeeded in getting a distant view of the bird. On 30th June I heard what was undoubtedly a greenfinch call note outside the house I was living in and ran out in rather scanty attire to look for the originator of the sound, but had to double back again when a lady of the station was seen coming up the road. The call note is precisely similar to that of the European greenfinch.

(776). *Passer domesticus.*—I saw a solitary example of the House Sparrow outside a hillman's hut at about 5,500 feet on 10th July.

(780). *Passer cinnamomeus.*—Agreeable as it is to get away from the common sparrow of the plains, the Cinnamon Tree Sparrow is quite an acquisition to the avifauna of the hill. This handsome sparrow is common and nests in holes in decayed trees about the hilltops. I saw eggs that were taken early in June and a pair building for a second brood on 30th June.

(793). *Emberiza stewarti.*—The White-capped Bunting is fairly common on the bare hills below the forests.

(794). *Emberiza stracheyi.*—The Eastern Meadow Bunting is common on the hilltop and nests in May and June. The nesting site is usually in a hollow on a hillside or in a cleft of a rock. The clutch appears to be only three. The eggs have the peculiar markings of the bunting family and are very like those of the English yellow hammer. When on the ground or the branch of a tree this bunting is constantly jerkily expanding the tail, causing the white outer tail feathers to flash into view. The call note is a "gwink gwink."

(803). *Melophus melanicterus.*—Driving to Abbottabad in the tonga on 19th May I caught a glimpse of a bird on the roadside, coloured black with rufous wings and tail, which puzzled me till I again met with the species on my way down from Thandiani on 10th July at about 5,500 feet. It was the Crested Bunting. This robin-like colouration in a bunting strikes one as strange at first. On the ground and walking, the attitude of this handsome bunting is very peacock-like. The head and breast are held very erect, while the tail, which seems to trail behind, is rather expanded.

(805). *Chelidon kashmiriensis.*—The little Kashmir House Martin takes up his summer abode in the verandahs of most of the houses that are situated on top of the hill. I am not sure that among some of the colonies there are not a few European house martins. The nests are built of mud and are precisely similar to those of the European house martin. The mud is carried to the nesting site in a lump on the outside of the bill and is deposited in position, the bill being shaken free and withdrawn. The mud receptacle when completed is lined with pine needles on which is laid a layer of feathers. Three or four plain white and rather oval eggs, measuring about ·78 × ·52 are laid towards the end of May, and the young are hatched out about the middle of June. The first broods leave the nests from the beginning to the middle of July. Seldom more than three eggs are hatched, and indeed three young, pretty well fill the nest when about half-fledged. As a rule there is never room for more than two heads at a time at the aperture of the nest to receive food, consequently one young bird is generally in the background and unable to procure sustenance till one or other of those at the entrance retires satisfied. The parents appear to use no discrimination in their feeding and it is a case of "survival of the fittest", the most vigorous securing the most food. On cold rainy days the young often have to go foodless for hours. One wet day I remember they were not fed from early morning till past 1 p.m. Ordinarily the nests are visited by the parents with food on an average every four or five minutes. For days before the young actually leave the nests the parents call to and endeavour to persuade them to venture forth, and I believe, when they do eventually leave, one parent enters the nest and pushes the young out while the other flies round calling to them with a loud note like "gip," quite unlike the ordinary martin twitter. As far as I could ascertain, the young, on leaving the nests, are at once able to forage for themselves on the wing, unlike young swallows, which are fed for some days after by their parents. The day they leave the nests they often return to them, when tired, to be fed again in a desultory sort of way by the parents. The nestlings are infested with lice and parasitic blood-sucking flies, and it must be a relief for them, on leaving the nest, to get away from these unwelcome guests. On examining a fallen nest I found agglomerations of eggs of lice or blood-sucking flies at the bottom of it, and colonies of lice in the interstices in the mud. I do not think that after the eggs are hatched the male sleeps in the nest, and indeed the female probably often sleeps away from it when her progeny attain to any size. I was unable to observe the second broods.

(810). *Ptyonoprogne rupestris.*—In a gully with steep cliffs on either side at about 6,000 feet I saw a number of birds flying about the cliffs, which looked to me like Crag Martins. I had not glasses with me and was unable to observe them closely. Visiting the place about a fortnight later I must confess to not having seen any birds there.

(813). *Hirundo rustica.*—On two occasions I thought I saw the Common Swallow flying about the hilltop.

(822). *Hirundo nepalensis.*—Hodgson's Striated Swallow breeds in small colonies about the bare hills below the forest. These swallows do not appear to build their nests together like martins, but a pair will build here and another there, sometimes widely apart where the rocks are unsuitable. The situation of nests, or rather remains of nests I saw, all appeared stupidly selected, being terribly exposed to wind and weather, and the nests had all collapsed. I passed a pair building on 10th July on an old site on the face of a rock sloping inwards on the side of the road, where any passer-by could knock the nest down. It was built of mud pellets similar to the nests of martins, but larger. Possibly these swallows also build in the verandahs of the hill-people's houses which stud the hillside about here. I certainly often saw them flying about outside these houses ; but in the verandah of one I examined I could find no nests. I was chary of extending my investigations to other houses after recent experiences in the Kurram Valley, where ornithological rambles led a friend and me to be suspected by the Turi villagers of being Government agents sent to poison their water-supply ! The note of this swallow as it flies round about the nest is a plaintive " piu piu ".

(832). *Motacilla melanope.*—I saw a young Grey Wagtail on the stream at Kala Pani on 9th July.

(844). *Anthus similis.*—The Brown Rock Pipit breeds on the bare hillside below the forest. I saw a female carrying food to a nest on the hillside above me on 10th July. While I was watching her, she was joined by two others which hovered kestrel-like above the place where the nest was.

(946). *Gecinus squamatus.*—The wild call of the Western Himalayan Scaly-bellied Green Woodpecker, to give him his full title, was a common sound in the woods, near the top of the ridge, in May. The nest is usually in a hole in a cherry tree, the entrance of which often appears small for the size of the bird. When the young are hatched, the parents are often to be seen perched on a bare bough keeping up an incessant squawking chuckle, the meaning of which is not easy to discover. The clamour of the nestlings may be likened to the distant sound of a puffing engine. It seems absurd to see young birds, after they are fully fledged and are quite as big as their parents, being fed.

(950). *Gecinus occipitalis.*—When first I arrived up I was much puzzled to discover the bird that made a loud repeated whistle note far down the hillside. One day being down some 2,000 or 3,000 feet I heard the note close to me and imitating it to the best of my ability, I had the satisfaction of seeing the author of the sound fly into a tree above me where I could examine him leisurely through my glasses. It was the bird I expected, namely the Black-naped Green Woodpecker. This woodpecker breeds about the same time as the last species but at lower elevations.

(960). *Hypopicus hyperithrus.*—Only once have I seen the Rufous-bellied Pied Woodpecker, when I came across a pair at about 7,000 feet. It is strange to see the two colours rufous and crimson contiguous in a bird's plumage.

(961). *Dendrocopus himalayensis.*—One of the commonest and noisiest birds on the hill is the Himalayan Pied Woodpecker. It occurs all over the ridge, from 6,000 feet up, in summer. The nest is usually in a hole in a wild cherry tree at about 15 or 20 feet from the ground. The male I believe takes his turn at incubating the eggs, as I distinctly saw a female feeding what appeared to be an adult male, who popped his head out of the hole to receive the food. When the young are hatched, both parents are indefatigable in their search for food for them, the female perhaps the more so, and make much noise over the process. Arriving at the nest with the bill from point to gape festooned with " poochies " they apparently feed all the clamouring young at each visit. The young of the first broods leave the nests about the middle of June.

(1066). *Upupa epops.*—The European Hoopoe is rather rare. A bird, which had arrived at the top of the hill on 4th June, sat in a cherry tree within 50 yards of my verandah and repeated his call of " hoop-hoop-hoop-hoop " for quite half an hour. Since then I have neither heard nor seen a hoopoe, though they probably occur lower down the hill.

(1069). *Cypselus apus.*—A big colony of European Swifts nested somewhere on the ridge, but I never discovered where. From 80 to 100 of these birds wheeling and dashing in their grand flight movements was an ordinary but always inspiring sight in the mornings and evenings above James' hill and out over the valleys.

(1072). *Cypselus leuconyx.*—Among the flocks of the last species a White-rumped Swift was occasionally to be seen, of about the same size as *apus*, which was most probably Blyth's.

(1077). *Chætura nudipes.*—On two or three occasions I saw the White-necked Spine-tail, " swiftest of living birds," displaying his powers of flight above the hill top.

(1095). *Caprimulgus indicus.*—The Jungle Nightjar is rare. One settled on a pine just outside the house I was living in, one evening, and kept up its rapidly repeated note of " chuck-chug-chuck-chuck " for fully ten minutes.

(1104). *Cuculus canorus.*—The common Cuckoo is quite a feature of Thandiani in May and June. It is easily observed and still more easily heard, the familiar call sounding all the day long in May. The male is often seen high up on the bare branch of a pine, with head down, tail elevated, drooping wings and body swaying from side to side, as he utters his repeated "cuck coo." There are several variations of the call. It generally begins with a deep " kokcoo" followed by a hoarse chuckle (a throat clearer possibly, the bird sometimes being distinctly hoarse), then the well known "cuck-coo" repeated over and over again. Sometimes the note is "Kŭk-coo" and sometimes, though rarely, the ordinary note is preceded by a syllable "ak" as "ak-cuck-coo." Often the call stops at the first syllable "cuck". When a female is seen or heard the notes are "cuck-coo, cuck-cuck-coo, cuck-cuck-coo" in a rising crescendo denoting extreme excitement. In my experience the cuckoo's notes do not alter as the season advances, as many observers assert. The bird is possibly more vigorous at the beginning of the breeding season, and his call may then be more prolonged, but the trisyllabic call "cuck-cuck-coo" is entirely connected with the proximity of the female. The variations of the ordinary call given above are just as likely to be heard at the beginning of the season as at the end. The note of the female is a bubbling "quick-quick-quick-quick," sometimes repeated more slowly. Occasionally she gives the hoarse chuckle like the male. The cuckoo's call was still occasionally heard when I left Thandiani on 9th July, but the breeding season was evidently rapidly drawing to a close. The eggs are commonly laid in the nests of *Oreicola ferrea* and *Larvivora brunnea.* I found no cuckoo's eggs in the nests of *Trocalopterum lineatum* or *Acanthopneuste occipitalis.* I took only three eggs from nests, and extraordinary to relate they were all blue! Two taken from the nests of *O. ferrea* were a greenish-blue very slightly spotted at the larger end with olive-green. The other taken from the nest of *L. brunnea* was a beautiful hedgesparrow blue unspotted. I was so puzzled at finding blue cuckoo's eggs, which I had every reason to believe were laid by the present species, there being no other Cuckoos to my knowledge frequenting the top of the hill, that I determined if possible to solve the enigma by examining an oviduct egg. With some difficulty I succeeded in bagging a female on 15th June and to my delight took the fragments of a blue egg (it having unfortunately been broken by the fall when shot) from the oviduct. This egg tallied with the one taken from the nest of *L. brunnea.* I have sent the skin and eggs to Mr. E. C. Stuart Baker for his information and opinion.* In two of the nests the cuckoo's egg had already been deposited when I found the nests, but in the third instance I did not get a cuckoo's egg till I had visited the nest for the third time, the cuckoo having meanwhile deposited her egg and extracted one of those of the parent bird. Young cuckoos were found in the nests of both *O. ferrea* and *L. brunnea.* The young of the foster parents are ejected by the young cuckoo as early as three days after being hatched and before the latter's eyes are opened.

(1105). *Cuculus saturatus.*—The "up-poop-poop-poop-poop" of the Himalayan Cuckoo is a common sound down hill during the month of May and June. I once heard the bird calling at about 8,000 feet, but this is an unusually high altitude for this species at Thandiani. I did not hear the call after June 30th. Although this cuckoo's notes may at first be confounded with those of the Hoopoe there is a good deal of difference. The cadence is the same, but the notes are much deeper and louder and are heard at a great distance. The female seems to have the same "quick quick" notes, but not so loud as those of the female *canorus*, and repeated more slowly. I did not find any eggs of this cuckoo.

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* See page 261 of this issue.—EDS.

(1108). *Hierococcyx sparverioides.*—On 6th June at about 8,000 feet I heard a solitary Large Hawk Cuckoo giving his "brainfever" call. Heard in the dense forest, the notes are quite musical and by no means aggravating. I kept up a duet with the bird, imitating his notes for some ten minutes. I was the first to get tired of the game. This was the only occasion on which I came across this species.

(1135). *Palæornis nepalensis.*—On the top of the ridge overlooking Nawashahr village on 10th July at about 5,000 feet a Paroquet flew over my head, which from its call I took to be the Large Indian Paroquet.

(1141). *Palæornis schisticeps.*—The Slaty-headed Paroquet occurs in fair numbers in the forest. The call or screech is soft and pleasing compared with that of *P. torquatus.* Nesting takes place in May and June, and young were being hawked about for sale in the station at the end of June and beginning of July.

(1175). *Scops spilocephalus.*—At 10 p.m. on the night of 5th July I heard a loud double whistle in the woods just below the bungalow, repeated for quite ten minutes. I attributed the call to the Spotted Himalayan Scops Owl. This was the only occasion on which I heard the notes.

(1193). *Gyps himalayensis.*—The Himalayan Griffon Vulture is the only large vulture I have seen on the ridge and it is common. I did not look for nests, but these birds probably breed among the cliffs and rocks on the east side of the ridge.

(1198). *Neophron percnopterus.*—The Egyptian Vulture arrives up about he end of May and becomes fairly common, probably nesting among the cliffs above mentioned.

(1199). *Gypætus barbatus.*—The Lammergeyer is almost as common as the Himalayan Griffon Vulture. I saw a young bird on the wing in the end of June.

(1210). *Ictinætus malayensis.*—I only once saw an example of the Black Eagle. It was hawking over the tree tops on the hill-side. Jerdon well describes the flight of this eagle as harrier-like.

(1217). *Spilornis cheela.*—I came across a pair of the Crested Serpent Eagle one day when down the hill-side about 1,500 feet. They wheeled close above me several times, uttering a kite-like cry. I saw another bird at about 8,000 feet on July 4th.

(1229). *Milvus govinda.*—On one occasion only, I saw a solitary example of the common Pariah Kite hawking round the bungalow and over some tents below.

(1230). *Milvus melanotis.*—On two occasions I saw a solitary example of the Large Pariah Kite foraging over the top of the hill.

(1247). *Accipiter nisus.*—The Sparrow Hawk is not very uncommon and apparently nests on the ridge. As I was one day seated on the edge of the khud, one of these birds suddenly appeared within a few feet of me on the lowest branch of a small pine just below. We eyed each other for a few seconds when he flew off following the line of the cliffs and silently and swiftly gliding round each bend in the hope of surprising some unwary bird. This little hawk might well be described as the panther of the bird kingdom, his flight is so silent and his manner of alighting in the middle of a tree or bush so stealthy.

(1255). *Falco peregrinator.*—I saw a fine example of the "Shahin" perched on a dead bough of a pine tree, on July 2nd. For some days following, this bird hung about the top of the hill.

(1260). *Falco subbuteo.*—On May 24th I noticed a small hawk overhead. Presently it dropped and settled on a dead pine and gave me an excellent and leisurely look at it through the glasses. It was a Hobby in beautiful feather. While preening himself, and resting, some jungle crows out of pure devilment commenced to harry him and drove him from his perch ; but the tables were quickly turned, the Hobby keeping easily above the crows and making some very business-like stoops at his would-be tormentors, which they quickly had enough of. The flight of this hawk is swift and powerful for its size. The bird seen was probably migrating, as I saw no others.

(1265). *Tinnunculus alaudarius.*—Several pairs of Kestrels nested in the cliffs on the east of the ridge. and it was a common sight to see one of these birds hovering over the hill top, probably in search of mice, the burrows of which riddle the whole top of the hill. If the breeze is sufficient, these birds can cease hovering and remain almost absolutely motionless poised in the air. I saw a kestrel one day stoop at a cuckoo perched on a pine branch and calling. Each time the kestrel stooped, the cuckoo dropped off his perch, returning to it and resuming his calling when the kestrel had shot past. Finally the kestrel prevailed and drove the cuckoo away. On July 6th I saw a kestrel fly down and pitch on the roadway outside the bungalow and proceed to take a dust bath, which was interrupted by some one coming along the road.

(1305). *Turtur ferrago.*—The Indian Turtle Dove is fairly common, nesting in the pine woods. This dove's note is a deep hoarse "Krŏo-krŏo-krŏo" very like our English woodpigeon's "ooo".

(1328). *Gallus ferrugineus.*—I was informed by a friend that the Red Jungle Fowl was shot by an acquaintance of his when shooting on the hill the previous autumn. I did not come across the bird myself.

(1334). *Pucrasia macrolopha.*—There were a fair number of pheasants breeding in the pine forests along the ridge, of which the Koklass was, I believe, one species, and 9 eggs I took from a hillman were, I believe, of this species.

(1336). *Gennæus albicristatus.*—The White Crested Kalij Pheasant is, I believe, another resident species.

(1342). *Lophophorus refulgens.*—The Monal has been shot on the hill.

(1378). *Tetraogallus himalayensis.*—My informant of the shooting of the Red Jungle Fowl also told me that he himself, when shooting pheasants in the autumn, tried to get a shot at a very large reddish bird seen near the top of the ridge, but was unable to get close enough. From his description of the colour, size, and flight of the bird, it could, I think, only have been the Himalayan Snow Cock.

(1597). *Nettium crecca.*—In September last year Capt. Skinner, R.E., shot a Teal in Thandiani from off a tiny pond, not much more than a puddle, just outside the bungalow he was staying in. This is surely a curious occurrence for the hills! He informed me too that he saw a sandpiper at the same pond in the same month!

For a few days at the beginning of July, before I left Thandiani, my attention was attracted on four or five occasions by a peculiarly sweet song uttered by some bird, which always kept to the densest cover. I made three separate attempts involving a good deal of climbing and forcing my way through thick bush to observe the skulking songster, but although I twice got within six or eight feet of him, I never on account of the dense foliage succeeded in getting a sufficiently clear view of him to be able to make out the coloration. All I could see was that it was a small bird. I had most reluctantly to leave the hill without knowing what the bird was. The song always commenced with a long whistle, at first very soft, and gradually increasing in volume of sound, followed by a "tĭtĭta-twēēt", then the same swelling whistle, but in a higher key, followed by a "twēēt tĕw." Possibly the bird was *Horornis pallidus*, the pale Bush Warbler, but if so then the last part of the song is not as described by Brooks.

A CONTRIBUTION TO THE ACULEATE HYMENOPTERA OF THE BOMBAY PRESIDENCY.

By

P. Cameron.

With 2 or 3 exceptions the species described in this paper have been taken at Deesa and Matheran by Lieut.-Col. C. G. Nurse.

Scoliidæ.

Discolia nigrobimaculata, sp. nov.

Red, yellow and black; the antennæ, face, clypeus, base of mandibles, a line, behind and touching the hinder ocelli, uniting the eyes at the hinder edge transverse in front, rounded behind, occiput, thorax, basal segment of abdomen except at the apex, the 5th and following segments, the ventral, and the legs, ferruginous, the front and vertex, except for the transverse line, the outer orbits, and the 2nd, 3rd and 4th abdominal segments for the greater part pale orange yellow; the following parts are black: the mandibles except at the base, a narrow line of equal width on the apex of the 1st abdominal segment, a wider one on the 2nd, obliquely dilated in the middle, a narrower one, less strongly dilated in the middle, on the 3rd, similar lines on the base of the 2nd to 4th segments, but more sharply triangularly dilated in the middle, except that on the 4th, which is only slightly dilated, and an oblique irregular spot near the middle of the sides of the 2nd, black; legs ferruginous, the hair white, the tarsal spines and culcuria pale ferruginous. The hair is pale ferruginous, darker coloured—more reddish—on the mesonotum and on the apical abdominal segments. Wings hyaline, largely tinged with fulvous on the fore margin, the apex in front from near the radial cellules, with a smoky violaceous cloud. ♀.

Length 15-17 mm.

Deesa, October (Nurse).

Head smooth, except for some scattered punctures on the front; the thorax closely, coarsely punctured, except on the apical slope of the metanotum.

Allied to *D. histronica*, F., which is a larger species, has the thorax largely infuscated, wants the rufous transverse stripe at the ocelli found in the present species; the abdominal yellow (at least on the 3rd and 4th segments) is not continuous, but forms large lateral spots and there is no black spot on the sides of the 2nd.

Pompilidæ.

Pompilus benedictus, sp. nov.

Black, the abdomen and legs except the coxæ, ferruginous, the head and thorax densely covered with silvery pubescence; wings hyaline, the apex from shortly behind the end of the radius smoky, flagellum fuscous, the scape covered with silvery pubescence; pronotum as long as the head; metanotum furrowed down the middle at the base and apex; the cubitus in hind wings received very shortly before the transverse median. Ocelli in a curve, the hinder separated from each other by a greater distance than they are from the eyes, which converge distinctly above and are hardly separated from the mandibles in front, but distinctly so behind. The 1st joint of the flagellum is clearly longer than the 2nd. Pronotum shorter than the mesonotum; the metanotum has a more oblique slope on the apex than on the base, where it is rounded. ♀ and ♂.

Length 6-7 mm.

Deesa (Nurse).

The 2nd abscissa of radius twice the length of the 3rd distinctly shorter than the space bounded by the 2nd recurrent (which is received in the middle of the cellule) and the transverse cubitals; the front (and larger) part of the 3rd transverse cubital has a sharp, straight oblique slope. The long spur of the hind tibiæ is half the length of the metatarsus; the claws without a tooth, but the anterior is dilated at the base. The radial cellule is sharp-pointed at the apex; the apical abscissa of the radius is a little roundly curved. The transverse median nervure in front wings not quite interstitial, being received shortly beyond the transverse basal. Fore tarsi with long, stout spines. The apical slope of metanotum distinctly transversely striated; the furrow deep in its middle. In the ♂ the 1st joint of the flagellum is as long as the 2nd; the claws are dilated at the base as in the ♀.

This species does not fit into any of the Ashmeadian genera. Except as regards the claws it might run into *Sericopompilus.*

Pompilus ithonus, sp. nov.

Black, densely covered all over with silvery pubescence, which gives it a grey colour, the wings hyaline, the apex from the end of the radius smoky, the nervures black, the 2nd abscissa of the radius 3 times as long as the 3rd, the latter distinctly less than the space between the 2nd recurrent and the transverse cubital nervures; the 2nd recurrent is received in the middle of the cellule, the apical abscissa of the radius is straight, without a curve, oblique. Apex of clypeus almost broadly rounded, the centre transverse, the sides broadly rounded. Apex of mandibles broadly rufous. Eyes a little converging above. Pronotum not quite so long as the head, its base distinctly narrowed, the apex angled in the middle. Metanotum long, gradually rounded from the base to the apex, the centre with a distinct, moderately wide longitudinal furrow. Tibial and tarsal claws moderately long, black, the long hind spur not two-thirds of the length of the metatarsus, the spines on fore tarsi long. Ocelli in a triangle; the hinder separated from each other by almost the same distance as they are from the eyes. The 1st joint of the flagellum is distinctly longer than the 2nd. ♀ and ♂.

Length ♀ 7 mm., ♂ 6 mm.

Deesa (Nurse).

The head viewed from the front as wide as long. The claws have not a distinct tooth at the base in either sex. The cubitus in hind wings originates distinctly before the transverse median nervure. Eyes reaching to the base of the mandibles on inner side. The tarsal comb long in ♀. The transverse median nervure is received shortly behind the transverse basal, almost interstitial.

This species does not fit into any of the genera in Ashmead's Revision (Can. Ent. XXXIV, p. 80—87). It comes nearest to the character given for *Ferreola*, but that has the claws in the ♀ with a tooth and in the ♂ they are cleft, it differing also in some other respects. The silvery pile on the base of the abdominal segments may become rubbed off.

SPHEGIDÆ.

Oxybelus latilineatus, sp. nov.

Black, a line on apex of pronotum, tubercles, a large oblique, somewhat oval spot on sides of scutellum, the base of post-scutellum broadly, the squamæ, the apex of central squama narrowly, and broad lines on the basal 4 abdominal segments, pale yellow, the Pygidium rufous, the underside of the 4 front femora, their tibiæ except for a black line behind, the hinder except for a line on the lower basal third and the greater part of the tegulæ, pale yellow; the tarsi yellow, tinged distinctly with fulvous. Wings hyaline, the nervures black. Central scutellar spine curved, about 4 times longer than wide, of equal width, the centre depressed, the apex transverse; the lateral spines rounded on outer side, gradually narrowed to a point, longer than they are wide at the base, the outerside depressed. Scutellum keeled down the middle. Metanotum areolated, the areæ large, the upper central smooth, shining, longer than wide, broadly pyriform, the narrowed end below. Mesopleuræ closely, rugosely punctured, opaque; the metapleuræ with curved, distinctly separated striæ. Abdomen strongly punctured throughout; the pygidium appears as if longitudinally striated and covered with a stiff depressed pile. Flagellum for the greater part reddish brown. Mandibles yellow red and black. There are no distinct furrows on the mesopleuræ. ♀.

Length 4 mm.

This species should be known by the areolated metanotum, the wide yellow band uniting the lateral spots on the post-scutellum, and the fulvous pygidium.

Oxybelus pictiscutis, sp. nov.

Black, antennal scape except above, a line, narrowed on innerside, on the sides of the pronotum, tubercles, tegulæ, an oblique; oval spot on the sides of scutellum, the lateral squamæ, apical half of spine, a semi-circular mark on the sides of 1st abdominal segment, a longer line, roundly dilated on the inner side at the base on the sides of 2nd, 2 longish lines on the 3rd and a continuous one on the 4th, pale yellow. Anterior coxæ black, the 4 posterior black above, yellow below, fore femora red in front, black behind at the base and above, the black line gradually narrowed towards the apex, the apex below it yellow, the 4 hinder red, the middle with the apical half broadly yellow; the tibiæ and tarsi yellow, the middle tibiæ broadly, the posterior at the apex behind black; hind spurs fulvous. Lateral squamæ large, broad at the base, gradually narrowed to a fine point; the central about 3 times longer than wide, of equal width, the apex with a triangular incision. Central area of metanotum irregularly coarsely aciculated above and with a few oblique irregular striæ, below it is smooth and shining, the sides of metanotum aciculated and bearing distinctly separated oblique striæ. Mesothorax strongly punctured, the pleuræ more strongly than the rest; down the centre of the latter is a furrow which extends shortly below the middle; on either side of its lower end is an obscure curved longitudinal furrow. Flagellum rufo-fulvous. Pygidium long, gradually narrowed from the base to the apex, which is rufous; it is strongly closely punctured. Mandibles broadly pale yellow at the base, a rufous belt beyond the yellow, the apex black. Wings hyaline, the nervures mostly black, tegulæ pale yellow. ♀.

Length 6 mm.

Deesa, December.

The puncturation is strong, the scutellar central keel is clearly defined; there is a stouter, less clearly defined one down the cêntre of the post-scutellum; the pubescence close, pale. The mucro is hollowed above, not curved.

Oxybelus fulvicaudis, sp. nov.

Black, the abdomen slightly tinged with bronzy colour, the last segment bright fulvous, the greater part of the 4 anterior tibiæ, the apex of the posterior, and the tarsi rufo-testaceous; the base of antennal scape narrowly, and its apex more broadly testaceous, the flagellum rufo-testaceous. Wings clear hyaline, the nervures and stigma fuscous. Scutellar process about 4 times longer than wide, curved, of equal width throughout, the apex with a wide, rounded shallow incision. ♀.

Length 4 mm.

Deesa, December (Nurse).

Lower part of front, face, clypeus and outer orbits covered with silvery pile. Front and vertex closely punctured, the former with a wide smooth depression, widest below in the middle of lower half. Clypeus smooth, depressed, brownish, its apex roundly projecting. Base of mandibles broadly pale yellow, the centre ferruginous, the apex black. Prothorax almost smooth, the mesonotum strongly, closely punctured, the scutellum similarly punctured; its centre is stoutly keeled, the sides and apex are also keeled, there being a crenulated furrow inside the keel. Metanotal area large, an elongated triangle, extending almost to the apex its sides at the base stoutly obliquely striated, the middle part aciculated, the apex smooth; the sides at the top stoutly, obliquely irregularly striated, the apex strongly aciculated, almost punctured. Mesopleuræ irregularly rugosely punctured; there is a wide furrow below the middle, the breast is bordered by a curved crenulated furrow. There is a striated area, bordered at the apex, by a curved furrow; the apex above is obscurely striated, below it is smooth. Basal segment of abdomen smooth, the rest closely punctured; the segments laterally covered with silvery pubescence, the pygidium with longish punctures and with silvery pubescence.

The lateral mucro is small, triangular, rounded on the outside, the central has the sides raised. Ocelli in a curve, the hinder separated from each other by double the distance they are from the eyes. Tubercles pale yellow.

A distinct little insect, not easily confounded with any of the known Indian species.

Oxybelus forticarinatus, sp. nov.

Black, the antennal scape, base of mandibles, the apex of pronotum, tubercles, a mark on the sides of the scutellum, oblique, oval, wider than long, the lateral squamæ, and broad transverse lines on the sides of the basal 4 or 5, abdominal segments, the apices of the 4 anterior femora, the underside of the anterior, the greater part of the 4 anterior tibiæ, the base of the posterior and the tarsi, yellow; the coxæ and the apical two-thirds of the hind tibiæ black, the 4 hinder trochanters and femora rufous; flagellum dark rufous. Wings hyaline, the nervures dark fuscous. Scutellar lamina large, twice longer than wide, roundly narrowed towards the apex, which has a Λ—shaped incision; the colour is rufous, yellowish round the edges; down the centre is a strong longitudinal keel, from which radiate some obscure striæ. ♀ and ♂.

Length 4-5 mm.

Deesa, March (Col. Nurse).

Head below the ocelli densely covered with silvery pubescence; the vertex less closely pilose, strongly, closely punctured; the front less closely punctured. Apex of clypeus with 3 short, stumpy teeth. Base of mandibles broadly yellow, the middle rufous, the apex black. Pronotum smooth, the apex carinate, the sides oblique. Mesonotum closely punctured, the scutellum more shining, more strongly punctured, but with the punctures much more widely separated and with a keel down the centre; the lateral laminæ triangular, longer than they are wide at the base, the outer side rounded, the apex ending in a curved point; the apex of the scutellum is depressed and has a stout central and 3 short, stout lateral keels. On the apical slope of the metanotum, on the upper half, is a triangular area, its apex being smooth, depressed, the rest being roughened; on either side is an oblique, narrower, triangular area; the sides are strongly keeled. Mesopleuræ somewhat strongly punctured, the metapleuræ obliquely striated, the striæ clearly separated. Abdomen strongly punctured, the penultimate segment more strongly than the other; the sides of the last raised, bordered by a smooth line, its apex transverse; there may be 2 more or less distinct yellow line on the 5th segment; the apical yellow lines are not so widely separated as the basal.

The amount of black, yellow and red on the legs varies, as does also the strength of the puncturation.

This species comes near to *O. squamosus*, Sm., the two may be separated by the form of the scutellar process; in *squamosus* there is no stout central keel and its centre is broadly raised; in the present species there is down its centre a stout longitudinal keel and the sides are raised; *i.e.*, there is a depression on either side of the keel; *forticarinatus*, too, is a much smaller species than *squamosus*—4-5 mm. as against 7 for the latter.

Dasyproctus testaceipalpis, sp. nov.

Black, the antennal scape, mandibles except at apex, an interrupted line on apex of pronotum, tubercles, the scutellar keels, 2 somewhat semi circular marks on the basal half of scutellum, a curved line, narrowed on the inner side, on outer fourth of 3rd abdominal segment at the base, and a much shorter one on the base of the 4th, pale yellow. Legs black, the 4 anterior femora for the greater part below and almost the apical half above, the 4 anterior tibiæ almost entirely, and the hinder behind, and the basal joint of the tarsi, yellow, the other tarsal joints rufous. Wings hyaline, the costa and nervures fuscous. Metanotum opaque, aciculated, almost punctured; there is no basal area; in the centre of the base are 2 keels forming an area; the part on either side is obscurely, irregularly striated; the apical slope furrowed down the middle; the pleuræ are more shining, distinctly, closely obliquely striated, the striæ strongest at the base. Abdominal petiole nearly as long as the following 2 segments united. Front, face and clypeus densely covered with silvery pubescence, the front above bordered by a keel. Front covered with shallow, clearly separated punctures; the vertex obscurely punctured ocelli in a curve. Propleuræ [illegible] in the centre; there are some longer striæ above. Palpi testaceous. ♀ [illegible] 7 mm.

Deesa, April (Nurse).

Head and mesothorax opaque; the mesopleural furrow obscurely crenulated. Tibial spines weak. The abdominal petiole is only slightly dilated towards the apex.

Tachysphex striolatus, sp. nov.

Black, shining, the head, pro and mesothorax closely punctured, the head more strongly than the latter, the metanotum strongly striated in the centre, the striæ there distinctly separated, the outer curved; the striæ on the sides closer and finer; the metapleuræ more irregularly, but still distinctly striated, the face and sides below the antennæ covered with silvery pubescence. Apical joints of tarsi rufous; the spines long, white on the anterior, there being at least 7 on the metatarsus. Eyes distinctly converging above, they are separated there by the length of the 3rd and 4th antennal joints united. Wings hyaline, the stigma fuscous, the nervures darker coloured; the 3rd abcissa of the radius not quite half the length of the 2nd. The 3rd and 4th joints of the antennæ are equal in length; the pedicle wider than long. ♀.

Lenth 6-7 mm.

Deesa, December (Nurse).

The apices of the abdominal segments have broad bands of silvery pubescence. The fovea on the apex of the metanotum is deep, triangular, longer than it is wide above; its central furrow clearly defined; the sides on either side, are transversely striated. Legs spines white; calcaria blackish. Tegulæ pale piceous.

VESPIDÆ.

Odynerus læviscutis, sp. nov.

Brownish-red, the clypeus and the 2nd abdominal segment above, except for a broad triangular mark on the base yellow, wings hyaline, tinged with fulvous, the apex slightly violaceous. ♂.

Length 11-12 mm. to end of 2nd abdominal segment.

"Bombay."

Closely, strongly punctured, the mesonotum only sparsely so, the scutellum smooth, impunctute, the top of postscutellum not quite so smooth, its apex rough, depressed in the centre, the apical slope steep, long, smooth, bluntly, roundly narrowed below. Apex of metanotum with a steep, vertical slope, closely, transversely striated, the sides above with 2 distinct teeth, of which the lower is the larger and thicker, and 2 indistinct ones below. First abdominal segment large, cup shaped, with a short, but distinct neck at the base; the 2nd wider than long, not reflexed at apex, nor narrowed at base. Temples somewhat short, broadly roundly narrowed. Base of thorax transverse without a raised margin, the apex almost transverse. There is a pale mark over the antennæ, which becomes gradually widened from the top to the bottom, the eye incision is also pale yellow.

This species is not unlike *O. punctum*; it is larger, has the scutellum distinctly narrower and transverse at the apex, the temples are shorter and roundly narrowed, the mesonotum is almost and the scutellum [illegible] smooth, not closely distinctly punctured as in *punctum*, the 2nd abdominal segment is shorter, and the wings lighter coloured, the apical cloud being very faint. The yellow on the 2nd abdominal segment is on the top only, not all round as in *punctum*.

Odynerus [illegible]icus, sp. nov.

Black, with the following yellow marks; antennal scape below, the lower part of eye incision—the line broad above, narrow below—a mark over the antennæ, dilated above, with the middle slightly incised and the sides rounded, mandibles, a small mark behind the eyes, 2 lines on pronotum, broad and oblique on inner side, post-scutellum, metanotal process, apex of basal 2 abdominal segments, the apical 2 in the middle, the latter lines broader than long, under side of 1st abdominal segment and the base of the 2nd yellow largely tinged with rufous. Legs yellow, the coxæ above and the femora rufous. Antennæ below towards the apex and the antennal hook reddish brown. Wings hyaline, the stigma brown, the nervures darker. Tegulæ yellow with a large dark fuscous mark near the base. ♂.

"Bombay."

Length to end of 2nd segment 6 mm.

First abdominal segment with a wide stout, transverse keel near the base; the next clearly longer than wide, its apex very slightly reflexed and with a row of strong punctures. Clypeus longer than wide, sparsely punctured, the sides obliquely sloped, the apex bidentate. Antennal hook stout. Base of thorax transverse, the apex laterally broadly rounded. Apex of post-scutellum broadly rounded. Thorax more than twice longer than wide. The keel on the base of the abdomen is broader, stouter and more clearly defined than usual. The puncturation is distinct, finer and weaker on the abdomen than on the head or thorax ; the whole body has a silvery pile. The 1st abdominal band is distinctly dilated on the sides and is narrowly bordered at the base with red, the 2nd is narrowed in the middle.

A distinct species of *Ancistrocerus*, which appears to be rare compared with *Odynerus, sensu str.* in India.

Odynerus (Ancistrocerus) xanthosonus, sp. nov.

Black, under side of antennal scape, clypeus, a small irregular spot over the antennæ, mandibles largely above, a line on pronotum, tegulæ except in centre, and the apices of abdominal segments, yellow. Legs, yellow, the coxæ in front, and the greater part of femora black, the middle femora with the apical half yellow in front. Wings fuscous, with a distinct violaceous tinge, the nervures and stigma black. ♂.

Length 10 mm.

Bombay.

Antennal claw stout, not reaching to the middle of 10th joint. Head closely punctured, thickly covered with long white hair. Clypeus roundly convex, sparsely punctured, the apical incision semi-circular. Thorax closely, strongly punctured, thickly covered with short thick white pubescence ; the punctures on the scutellum are more widely separated ; the scutellum slightly depressed in the middle ; post scutellum rugosely punctured, its apex with an oblique slope. Median segment short, rugosely reticulated, except in the middle, the rugose part clearly separated by a keel, the centre with a stout keel.

Rhynchium auratiacum, sp. nov.

Orange-yellow, the antennal flagellum, vertex and mesonotum of a deep orange colour ; wings hyaline, slightly infuscated, the costa and stigma orange yellow, the costal cellule tinged with fulvous. ♂.

Length to end of 2nd abdominal segment 8 mm.

Deesa, October (Nurse).

Head and thorax closely and strongly punctured, the puncturation on the abdomen finer. Clypeus distinctly longer than wide, the middle above wide and transverse, the apex with a shallow rounded incision; the puncturation weak and sparse. Base of thorax quite transverse, the sides not projecting Top of post scutellum broadly rounded, the apex with a serrated edge, the apex with a straight steep slope, smooth, except narrowly above, the apex transverse. Apex of metanotum with a steep slope, finely, closely transversely striated ; the upper half of the sides closely serrated, the lower less strongly serrated, the center with a slight projection. First abdominal segment cup-shaped; the second wider than long, the apex broadly depressed, much more strongly punctured than the rest, the punctured part projecting roundly backwards in the middle ; the extreme apex slightly rofixed. Mesopleural furrows distinct the part enclosed by them forming almost a triangle. Antennal hook moderately stout, its apex reaching to the base of the 10th joint.

A distinct species easily recognised by its colour from the known oriental species.

ANTHOPHILA.

Andrena bombayensis, sp. nov.

Black, the abdomen, legs and tegulæ rufo-testaceous, the labrum and mandibles, except at apex, of a darker rufous colour, wings clear pale hyaline, the stigma and nervures pale testaceous, the costa darker coloured; the 2nd abscissa a little more than half the length of the 3rd, the 2nd cubital cellule almost square, the recurrent nervure received near its apex. Metanotal area at the base finely obliquely striated, the striæ weaker on the centre than on the sides. Labrum shining smooth, not furrowed; the lower edge of the clypeus dark rufous. Face and clypous rough, thickly covered with pale pubescence. Mesonotum and scutellum smooth and shining. Post-scutellar region thickly covered with white depressed pubescence. Extreme base of antennal scape dark red; the flagellum for the greater part rufo testaceous. The hair on the legs is long, dense and pale; the calcaria rufo-testaceous. Abdomen long[illegible] ovate, longer than the head and thorax united. Clypeus broad, its apex f[illegible] with long, stiff fulvous hair. Temples rounded. Apical segments of abdomen infuscated.

Length 6 mm.

Runs into Bingham's section B "Enclosed space at base of median segment finely obliquely striate," which contains few species.

Deesa, April.

Andrena levilabris, sp. nov.

Black, the head and thorax densely covered with long whitish hair, the abdomen with white, depressed hair bands, the hair on the apex long, stiff, black, the middle hairs dark testaceous on the apical half, the area on metanotum closely rugosely punctured, the sides more strongly punctured; labrum smooth, shining, without a furrow, round the apex fringed with long pale fulvous hair. Clypeus closely, somewhat strongly punctured. Mesonotum with a distinct furrow down the centre of the basal half. Wings hyaline, slightly suffused with fulvous, the stigma dark testaceous, the nervures blackish, the 2nd abscissa of radius one-fourth longer than the 3rd; the 1st recurrent nervure is received shortly behind the middle. The basal joints of the hinder 2 tarsi and the hind tibiæ are densely covered with rufo-fulvous hair. ♀.

Length 11 mm.

Ferozepore, May (Nurse).

A stout broad species. Head narrower than the thorax; mandibles black, labrum semi-circular. Abdomen broad-oval, shorter than the head and thorax united, its back closely, finely punctured. Antennæ black, the 2nd joint of flagellum narrowed at the base, slightly, gradually widened towards the apex; it is distinctly longer than the following 2 united, the following is distinctly shorter than the 4th.

Andrena punjabensis, sp. nov.

Black, the clypeus, except for a roundish black spot on either side of the middle and the apical segments of the abdomen, pale yellow, the apical joints of the tarsi fulvous, wings hyaline, the costa and stigma fulvo-testaceous, the nervures darker coloured, the 3rd abscissa of the radius a little longer than the 2nd; the recurrent nervures are received about the same distance from the cubitals, the 2nd near the base of the apical fourth. Vertex and front opaque, shagreened, finely striated below the ocelli. Pro- and mesonotum shining, sparsely, weakly punctured; the metanotum opaque, coarsely shagreened, almost punctured, the basal area not clearly defined. Abdominal segments with narrow, but distinct bands of white pubescence. Flagellum brown, black on top. Calcaria white. The transverse median nervure is received shortly behind the transverse basal. Temples obliquely narrowed. ♂.

Length 7 mm.

Ferozepore, February, (Nurse.)

The abdomen is longish-ovate, more narrowed at the apex than at the base; the apices of the segments under the hair bands are pale lead-coloured. The occiput is not wider than the thorax. Labrum black, fringed laterally by white pubescence, in its centre is a curved transverse furrow. 2nd joint of flagellum not quite so long as the following 2 united.

Allied to *A. satellita*, Nurse, which may be known from it by there being a yellow spot on either side of the clypeus and by there being a distinct keel down the middle of metanotum, and the 1st recurrent nervure is received nearer the middle of the cellule.

Halictus dessanus, sp. nov.

Black, the basal 2 abdominal segments red, under side of antennal scape reddish brown; the pubescence white; the abdominal segments with bands of white depressed pubescence; wings hyaline, the stigma and nervures fuscous; the 2nd abscissa of radius a little shorter than the 3rd, the 1st recurrent nervure interstitial with the 2nd transverse cubital nervure; the 2nd abscissa of cubitus as long as the space bounded by the 2nd transverse cubital nervure and the 2nd recurrent, the 3rd transverse cubital nervure roundly sloped, not very oblique; area on metanotum with some irregular, more or less curved and oblique striæ, the rest of it smooth and shining; striæ do not reach to the top of the apical slope. Anal rima large, not clearly defined, dark rufous. Apex of clypeus broadly and clearly depressed, transverse. The 1st abscissa of the radius is clearly longer than the 2nd. ♀.

The ♂ is similarly coloured; the alar nervures are paler and the 2nd cubital cellule is smaller apparently.

Length 8 mm.

There is no clearly defined anal rima, but otherwise it seems to be a true *Halictus.*

Deesa, February and March (Nurse).

Halictus latisignatus, sp. nov.

Length 7 mm. ♀ & ♂.

Matheran, March.

This species is very similar in size and colouration to *H. deesanus* described above; the 2 may be separated thus:—

1st abcissa of radius, if anything, longer than the 2nd; the 2nd recurrent nervure almost interstitial, the metanotal area with stout clearly separated striæ, the metanotum shining, not distinctly aciculated, the rima not clearly defined, nervures dark testaceous ....*deesanus.*

1st abscissa of radius half the length of the 2nd; the 2nd recurrent nervure clearly separated from the transverse cubital; the metanotal area with close, fine striæ, almost forming reticulations, the rest of the metanotum distinctly aciculated, almost punctured, the anal rima distinct, triangular; nervures pale testaceous .. ..*latisignatus.*

The 2nd cubital cellule is not much longer than wide; in *deesanus* it is much narrower, being half the length along the radius that it is along the transverse cubital. Pubescence clear white; the abdominal segments have distinct bands of white pubescence. Apex of clypeus slightly depressed, the sides appearing therefore slightly raised. The pubescence on the head is closer and somewhat stronger than it is on the thorax. Apical joints of tarsi rufo-testaceous. The base of the 3rd abdominal segment is seen to be rufo-testaceous when the pubescence is absent.

H. rubescens, Nurse, is very similar but may be readily separated by the median segment being opaque and granular-punctured all over, the area, too, being only defined by the stronger puncturation.

Halictus abuensis, sp. nov.

Dark blue, the abdomen black, tinged with blue and violaceous, the clypeus tinged with violaceous, the pubescence pale cinereous, the apices of the basal 4 abdominal segments with a whitish hair band; legs black, the apex of the femora and the tibiæ and tarsi rufo-ferruginous; wings clear hyaline, the stigma pale testaceous, the nervures blackish; tegulæ pale piceous. ♀.

Length 7 mm.

Abu (Nurse).

Metanotal area closely longitudinally striated, the striæ more or less twisted. Head, pro and mesothorax closely, distinctly punctured; the punctures on the clypeus larger, deeper and much more widely separated, its apex is impunctate. Head moderately large, as wide as the thorax. Abdomen shining, closely, minutely punctured; the apex of rima rufous. The 2nd cubital cellule of equal width; the 1st recurrent nervure interstitial. There are no transverse lines on the basal abdominal segments.

In Bingham's arrangement this species would come in close to *propinquus* and *vernalis*, with neither of which can it be confounded.

Halictus clarus, Nurse.

Journ. Asiat. Soc., Beng. LXX, 1901, 147.

The undescribed ♂ of this species is similarly coloured to the ♀, except that, as usual, the apex of the clypeus is broadly yellow; the flagellum is pale brown except above; the coxæ, trochanters and femora are black, as well as more or less of the hind tibiæ. Probably the amount of black on the legs varies; according to Col. Nurse, *i.e.*, the "femora, tibiæ and tarsi of the median and posterior legs" are honey-yellow, but in the examples of *clarus* I have had from Col. Nurse, these organs are largely marked with black. *H. lucidipennis* Sm. from:" Northern India" appears to be a closely allied species. In *clarus* the green as usual runs into brassy and even purplish tints. *H. propinquus*, Sm. is a closely related species; it may be known by its larger, broader, more oval form and by the apical slope of the metanotum, being distinctly margined laterally, a structure not mentioned by authors. *H. clarus* occurs at Matheran as well as at Deesa.

Halictus emergendus, sp. nov.

Black, the head except the vertex, thickly, the pro and mesothorax less closely, the post-scutellum very closely, and close distinct bands of pubescence on the apices of the abdominal segment, white; the hair on the legs white, the apical joints of the tarsi more or less rufescent; the spurs white, tinged with rufous. Wings hyaline, the stigma and nervures pale testaceous. Basal area of metanotum with irregular, more or less divergent, oblique striæ; the sides of the apical slope distinctly, and the top less strongly, keeled. Basal segment of abdomen smooth, impunctate, shining; the other segments closely, minutely punctured, without transverse furrows; the rima is edged with dark rufous pubescence, and is black. Wings hyaline, the stigma testaceous, the nervures darker coloured. Eyes converging below. Clypeus strongly, but not very closely punctured. Mesonotum closely, distinctly punctured, forming almost fine reticulations at the base; the scutellum is more shining and less strongly punctured. Tegulæ piceous. ♀.

Length 4-5 mm.

Matheran, March.

The striæ on the metanotal area form almost reticulations at the base; the striæ are certainly more "oblique, divergent," than "longitudinal," so the species comes into Bingham's section A., near *catullus*; the basal segment of the abdomen is only glabrous in the centre, the base and sides being covered with white pubescence.

NOTES ON A COLLECTION OF SNAKES FROM THE KHASI HILLS, ASSAM.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

During August, September, and October this year in Shillong I acquired, among other natural history objects, a large and fairly representative collection of snakes, amounting to 264 specimens, representing 29 species, of which one, a *Typhlops*, is new to science. This I propose to name *tephrosoma.* The locality is a peculiarly attractive one to the collector, as much from the interest attaching to it from geographical considerations as for the abundance of the species available, many of which seem to be peculiar to this and the neighbouring hills.

Shillong is situated in the Khasi Hills of Assam at an altitude of 4,900 feet. From 4,500 to 5,500 feet probably indicates the outside limits from which all the specimens were derived with one exception, *viz.*, *Dipsadomorphus cyaneus*, which I got at Nongpho (1,800 feet).

Referring to Boulenger's Catalogue of the Snakes in the British Museum (1893 to 1896), Sclater's List of Snakes in the Indian Museum (1891), and my own notes which include two new species, the descriptions of which appear in this issue, there are at least 79 species known to inhabit Assam. Some of these appear to be restricted to the Hills, but it would be difficult to define the limits of elevation within which they occur. Similarly, it is impossible to fix any limit to the elevation to which the species commonly met with in the plains may wander.

The mortality from snakebite appears to be insignificant. The Khasis that I interrogated assured me that though snakebite casualties were not uncommon, fatalities were rare. This received confirmation in two quarters. The Cantonment Magistrate in answer to my enquiries informed me that since 1899 (prior to which no records are available) no death within Cantonments had been returned as due to snakebite. Again, at the Civil Hospital I was told that cases of snakebite were not uncommon. Many of the cases, however, merely received treatment, and insisted on returning to their homes, the ultimate issue of these cases being lost sight of, but no death had been reported. Of eight cases that were actually admitted into this

Institution since 1902 (prior to which there are no records), all recovered, and were discharged in from one to five days.

At the altitude of Shillong at least 10, possibly all of the 12 poisonous species recorded from Assam, may be met with. These are as follows :—(1) *Bungarus bungaroides*, (2) *B. fasciatus*, (3) *B. lividus*, (4) *Naia tripudians*, (5) *N. bungarus*, (6) *Callophis macclellandi*, (7) *Ancistrodon himalayanus*, (8) *Lachesis monticola*, (9) *L. jerdoni*, (10) *L. mucrosquamatus*, (11) *L. purpureomaculatus*, (12) *L. gramineus*.

I am not aware of Nos. 2 and 3 having been met with at this elevation, but see no reason why an occasional specimen should not occur, seeing that I obtained one specimen of *Naia tripudians* in Shillong and saw a specimen of *Bungarus fasciatus* which had been killed on the Ghat road, at an elevation of probably about 3,000 feet.

Of the 12 poisonous species at present known and just enumerated, only two are common, *viz.*, *Lachesis monticola* and *Callophis macclellandi.* With the exception of *Lachesis gramineus* which holds an intermediate position, all the other varieties are decidedly uncommon. I think there can be little doubt that *Lachesis monticola* is responsible for a very large majority of the cases of snake-poisoning which occur. Its abundance, its quick temper, and the swiftness with which it unhesitatingly inflicts a bite justify such a conclusion : and this is amply confirmed by the reports of the Khasis who very consistently declared its evil reputation ; and though the names they gave to other species were notably inconsistent, they all were unanimous in calling this " B'sein longkru." *Callophis macclellandi* appears to be a very peaceably inclined creature, if not actually timid. It rarely attains a length of 2 feet, but of course length has little bearing on the virulence of a poison. Repeated enquiries failed to elicit any information with regard to its bite which I think significant. A snake so common and at the same time so striking in appearance could, I think, hardly escape an evil reputation if serious consequences or death attended its bite. It is noteworthy that the records available of the cases of snakebite admitted into the Civil Hospital show that in no case were any constitutional symptoms observed, though local effects were usually pronounced. This points to a viperine type of poisoning rather than a colubrine, and adds support to the supposition that *Lachesis monticola* is to be blamed rather than *Callophis macclellandi* for the majority of casualties due to snake-poisoning.

I have adhered to the nomenclature set forth in Boulenger's Catalogue of the Snakes in the British Museum (1893 to 1896).

With one or two exceptions, the names given me by the Khasis expressed such a diversity of opinion that I have had to abandon any attempt to give vernacular names.

Family 1.—TYPHLOPIDÆ.

Typhlops diardi.

I obtained one very fine adult, 1 foot 6¼ inches long of this the commonest *Typhlops* to be found in the plains of Burma and Assam. Like many other species common in the plains, it occurs up to 5,000 feet altitude or even higher, but becomes increasingly scarcer up to these elevations.

The scales anteriorly were 26, in midbody 26, and posteriorly 24. This I find the usual arrangement of scales in this species, and the reduction of rows from 26 to 24 is brought about by the absorption of the row next to the median ventral into the median ventral.

Typhlops tephrosoma, sp. nov.

A single small specimen of this genus, measuring 7½ inches, was brought to me on the 24th of August, which is sufficiently distinctive to warrant specific rank.

Description.—Snout rounded ; nostrils lateral. *Rostral.* Upper portion about one-third the width of the head, not extending as far back as a line connecting the anterior edges of the eyes. *Nasal.* Not completely divided, the superior suture issuing from the nostril not reaching the rostral ; the inferior suture running to the 2nd labial. *Præocular.* Subequal to the ocular, in contact with the 2nd and 3rd labials. *Eyes.* Very indistinct and small. *Ocular* touching the 3rd and 4th labials. Diameter of body $\frac{1}{34}$th the body length. *Scales.* Anteriorly 28, midbody 28, posteriorly 24. *Colour.* Pale ashy grey rather darker dorsally.

None of the other species found within our Indian area has the scales in 28 rows, except *acutus*, a very distinct form, peculiar specially in the conformation of the snout.

Tephrosoma is most like *diardi*, differing in the scales numbering 28, the rostral not extending as far back as the eyes, the small indistinct eyes, and the colour.

Family 7.—COLUBRIDÆ.

Subfamily 2.—COLUBRINÆ.

Polyodontophis collaris.

I acquired 24 specimens, 12 ♀, 10 ♂ and 2 not sexed. The largest a ♀ measured 2 feet 8 inches.

Food.—Only two had recently fed. One contained "in gastro" the tip of a snake's tail, peculiar in that the subcaudals were entire, and it is probable that the species is one hitherto unknown to science. The other had eaten a skink, *Lygosoma indica.*

Breeding.—Two specimens were doubtless this year's progeny—one obtained on the 10th September, measuring 9 inches; the other on the 15th September, 10 inches. It was noticed that the secretion of the anal glands in the former was abundant, and odoriferous as in adults, and this is in consonance with my observations regarding many other species, which makes me doubtful whether these glands are associated with the sexual functions at all, as is assumed by Darwin* and others. The secretion of these glands in *collaris* is custardlike in colour and consistency.

Shield characters.—The scales are 17 in the whole body length. With two exceptions, the supralabials were 10, the 4th, 5th and 6th touching the eye, and the 10th largest. This last is an important feature, which, taken in conjunction with the number of the labials will, I believe, suffice to identify this from all other Indian Snakes. The temporals were alike in all, a single anterior shield being in contact with the 8th only of the supralabial series. The ventrals in the ♀ varied from 168 to 179, in the ♂ from 168 to 174. *Subcaudals*, ♀ 103 to 112, ♂ 107 to 118. At least 10 specimens had the tail imperfect.

Anomalies.—The last ventral was divided in 2 specimens. The supralabials were 9 in 2 specimens on the left side only, in one the 4th and 5th only and in the other the 6th also touched the eye.

In all specimens the rufous collar was very conspicuous. Though usually very sombre in its dorsal colouration, some specimens were enlivened with a rich ruddy glow in the dark brown. The belly was bright yellow, and merged into a bright carrotty-red at the edge of the ventrals.

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* Descent of Man, p. 589.

It is one of the commonest snakes about Shillong, and appears to be restricted mainly, if not entirely, to upland regions. Out of some two or three hundred snakes collected by me in Dibrugarh not one representative of this species has reached me as yet.

I encountered two examples alive, but both, though active and making every endeavour to escape, did not bite me, nor the stick laid over them when effecting capture.

Tropidonotus parallelus.

I acquired but one of this seemingly upland species, which appears to be as uncommon as it is localised. This was a ♀ 2 feet 4 inches long, the tail 7⅛ inches. The ventrals are 163, subcaudals 80. Præoculars 2. Temporals 2 anterior. Scales 19 anteriorly, 19 in midbody, 17 posteriorly. The reduction in rows from 19 to 17 is effected by the coalescence of the 3rd and 4th above the ventrals. The dorsal pale bands are not very conspicuous. The underparts are bright yellow.

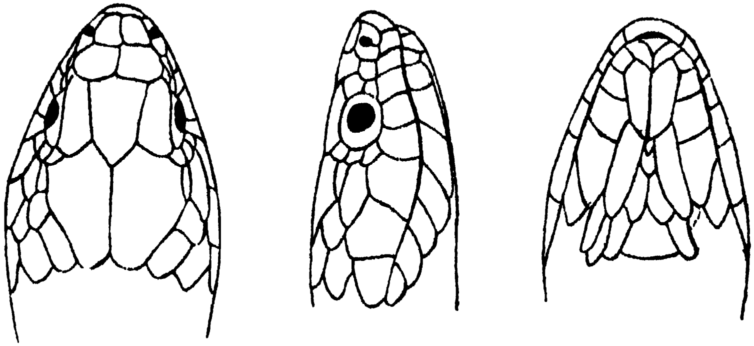

Fig. 1
Tropidonotus parallelus
(× 2)

Tropidonotus khasiensis.

Eleven specimens, 3 ♂, 4 ♀ and 4 not sexed of this snake which is only known from the Khasi Hills* came to bag. The largest was a ♂ 2 feet 2⅝ inches. Ventrals ♂ 153 to 155, ♀ 148 to 155. Subcaudals ♂ 91 to 96, ♀ 88 to 89. Præoculars single in all. Scales 19 anteriorly, 19 in midbody, 17 posteriorly. The reduction from

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* Annandale records it with doubt from Burma (Journ. Asiat. Soc. Bengal., 1905, p. 210).

19 to 17 is occasioned by a confluence of the 3rd and 4th rows above the ventrals.

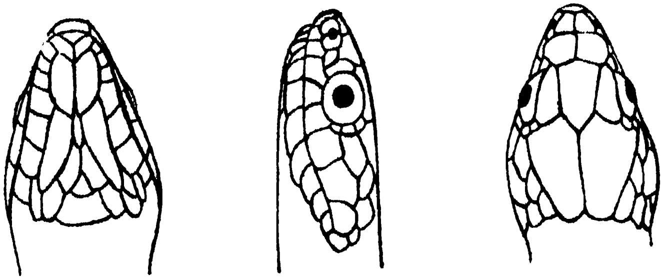

Fig 2
Tropidonotus khasiensis
(× 2)

Anomalies.—Eight supralabials in three specimens, the 3rd, 4th and 5th touching the eye on both sides in one, the 4th and 5th only on the left side in two examples.

Breeding.—2 young measuring 7½ and 7⅝ inches were obtained in October. The secretion of the anal glands is custardlike in colour and consistency. All specimens are blackish-brown (not pale-brown as stated by Boulenger in his Catalogue, Vol. I., p. 223) dorsally, with obscure black spots showing a tendency to transverse distribution. A more or less distinct (usually obscure) nut-brown or rufous series of dorsal spots on the 6th row above the ventrals, much as in *himalayanus*. The upper labials white (not yellow), finely speckled with black especially about the sutures. A yellow streak from above gape to the sides of the neck. Underparts white (not yellow), with a regular row of conspicuous black, lateral, ventral spots, often more or less confluent.

I captured one at dark whilst it was trying to cross the road. It was very active, and gave me some trouble, partly owing to my caution in dealing with a snake it was too dark to recognise.

Tropidonotus piscator.

I obtained 45 examples, a large number of which were young of this year. All the specimens were olive-green, or olive-brown with black, blackish, or obscure quincuncial spots of various size, and thus conformed to the varieties, *punctatus*, *quincunciatus*, *and obscurus*, referred to in my paper on this species in an earlier issue of this Journal

(Vol. XVII., pp. 861-2.) It is perhaps remarkable that no highly ornamented varieties were met with when one considers the brilliancy of the red adornment in the species *subminiatus* and *himalayanus* collected in these Hills.

Breeding.—The first point deserving mention is the lateness of the breeding season in these Hills as compared with that in the plains. In Shillong eggs were hatching in August and late in September, whereas in Dibrugarh this year they were hatching in June. It seems to me one should expect rather the reverse, for where the climate is temperate, and the cold season severer, and more protracted, it would seem important to the life of the offspring that they should be cast adrift early, to allow of their obtaining an ample sustenance to prepare them for the period of hibernation.

Eggs.—On the 8th of August, 10 eggs were brought to me, measuring from 1½ to $1\frac{7}{20}$ inches. An embryo was extracted from one which proved to be 5¾ inches long. On the 2nd September another was extracted, which was 7½ inches long. On the 8th September one hatched ; 3 more hatched on the 14th, 2 on the 16th, 1 on the 17th, and the last on the 18th. These hatchlings varied in length from 7½ to 8½ inches.

The exit apertures in the eggs were very variable in number and extent. In one egg there were as many as 6 cuts, more or less parallel in direction, the longest over half an inch long. In another there was but one cut and this only a quarter of an inch in length, through which the embryo had managed to squeeze itself.

Young.—In August I obtained 12 of this year's progeny measuring, from 6¾ to 9¼ inches. In September I got 3 hatchlings from 7½ to 9¼ inches in length, the smallest of which was obtained as late as the 22nd.

In the specimens I hatched out, the fœtal tooth was plainly to be seen and felt. Its attachment is firm. Seen in profile, it is hardly or not apparent, as it does not project beyond the rostral; in fact, this shield must be flattened to permit of this structure being brought into use. The cutting edge, which is directed forwards, is seen to be practically bidentate owing to a shallow, but broad, median emargination. A figure is given showing its position, and form on page 501 of this issue, contrasted with a similar structure in the Indian slow-worm.

Anomalies.—In one example the anal shield was entire, and in another there were three internasals, 1+2. It is to be noted that in all these specimens the carination of the scales is rather feebler than that usually met with, so that it is possible they might be referred by some to the species *sanctijohannis* of Boulenger's Catalogue (Vol. I., p. 230).

These specimens, however, conform so completely with my conception of the species *piscator* that I do not hesitate to pronounce them as such, especially as I find that the degree of keeling in this as in all other keeled snakes with which I am familiar is subject to considerable variation.

Tropidonotus himalayanus.

Six specimens, 2 ♂, 3 ♀, 1 ? all adults, varying from 1 foot 11¼ to 2 feet 8 inches. Ventrals, ♂ 157 to 162, ♀ 164 to 165. Subcaudals, ♂ 79 to 82, ♀ 82 to 85. Scales, anteriorly 19, (except in one where they counted 17), midbody 19, posteriorly 17. The reduction from 19 to 17 is caused by the confluence of the 3rd and 4th rows above the ventrals. Labials, 8, the 4th and 5th touching the eye in all.

Anomaly.—One specimen has 4 postoculars on one side.

All the specimens were remakable for the brilliancy of their adornment—a feature to which Boulenger makes no reference. (Catalogue, Vol. I., p. 251.) Besides the more or less conspicuous yellow or orange collar with its broader black posterior border mentioned by Boulenger, these specimens were ornamented behind the yellow with an intensely brilliant chequering of vermilion, more or less apparent in the anterior half of the body, but reducing in brilliancy from before backwards. These specimens constitute a very distinct colour variety, to which *ornatus* would be appropriate. I am familiar with the species, as I have obtained several specimens this year in Dibrugarh. None of these, however, are ornamented with red, though the orange collar is as conspicuous as in the Hill form. One specimen I caught alive just below Shillong. It moved as expeditiously as others of this genus, but made no attempt to bite me, confining its efforts to violent struggles for liberty. When grasped by the tail, it immediately described a rapid corkscrew movement of the body, which caused this appendage to snap off in my hands, and restored a liberty of brief duration. This is a common manœuvre with snakes, and accounts for a large number of the species of *Tropidonoti* in particular that are brought in to one with imperfect tails. I was less fortunate with a second specimen encountered the same day as the above. It disappeared like a flash down a steep incline, where I could not follow it.

Tropidonotus stolatus.

34 specimens. With few exceptions, these had 7 supralabials, the 3rd and 4th touching the eye.

Anomalies.—One specimen had two loreals } on each side. The temporals were two on both sides in one example. Supralabials 6 in three specimens on one side, the 2nd and 3rd touching the eye in one, and the 3rd only in two specimens ; 7, the 4th only touching the eye on both sides in one specimen.

Breeding.—The season as in the case of *piscator* is much later in these Hills than in the plains.

In Dibrugarh this year I had many gravid mothers in April, May, and June, and the young were hatching in June and July. In Shillong I had an unusually large gravid ♀, measuring 2 feet 5 inches, brought to me on the 10th of August, and another with three eggs on the 25th of that month. On the 8th of August a ♀ was brought in with 7 clustered eggs with which she was stated to have been found. One was opened, and contained an embryo 3¼ inches long. They were kept, but failed to hatch out.

Eggs.—These varied considerably, the smallest was 1⅛ × ¾ and the largest 1⅜ × ⅝ inch.

Food.—Six specimens had fed, and had taken frogs in every case.

No examples were adorned with red.

Tropidonotus subminiatus.

12 examples, 4 ♂, 4 ♀, 4 not sexed. The largest was a ♀, 3 feet 6½ inches long. Ventrals, ♀ 158 to 169, ♂ 160 to 168. The tail was imperfect in all the examples but three, in which they varied from 83 to 97. Scales, 19 anteriorly, 19 in midbody, 17 posteriorly. As in others of this genus, the reduction from 19 to 17 is due to a coalescence of the 3rd and 4th rows above the ventrals.

Anomalies.—The præoculars were two in two specimens. Supralabials 8, with the 3rd and 4th touching the eye in one example, the 4th and 5th touching the eye in three; 9, the 4th, 5th and 6th touching the eye in two examples on both sides, and in one on one side.

Food.—One had eaten a frog.

Breeding.—A juvenile specimen obtained in October was 8¾ inches long.

In certain aberrant specimens the supralabials conform to the arrangement usually met with in *himalayanus* and these are very apt to be confused with this latter species. *Subminiatus* is, I think, of stouter habit, but perhaps even a practised eye might be misled in this particular. The colour in these examples is of great importance. In all the specimens of *subminiatus* that I have met with and I have seen many from various altitudes in Burma, one from the plains of Assam (Dibrugarh), and several from the Khasi Hills the vermilion adornment is very distinctive. It forms a broad band behind the orange collar without the intervention of any black, but no chequering on the body. The most conspicuous chequering on the dorsum is of a bright yellow hue, especially anteriorly. This becomes progressively more obscure posteriorly, but is more or less apparent in the entire body length.

Pseudoxenodon macrops.

One example, a ♂, 2 feet 9¼ inches long, the tail 6½ inches. Ventrals 162. Subcaudals 65. Scales anteriorly 19, in midbody a reduction takes place to 17, posteriorly 15. The reduction from 19 to 17 is caused by a coalescence of the 3rd and 4th rows above the ventrals; the second reduction from 17 to 15 I have omitted to remark upon. If the step from 19 to 17 occurs with constancy in midbody, this snake is, I think, unique among our Indian species. As far as I am aware, in only one other snake of this family does reduction take place at this spot, *viz.*, *Zamenis mucosus*, many examples of which reduce (in this case from 17 to 16) at or even before the middle of the body.

Colour.—This agrees with Boulenger's description (Catalogue, Vol. I., p. 271), except that there is no distinct postocular streak, and the dorsal colour is olive-green with lighter transverse bars most distinct in the posterior part of the body. A pinkish-brown streak occurs at the edge of the ventrals.

Trachischium monticola.

Twenty-eight examples, 13 ♂, 13 ♀, 2 not sexed. Seven females are longer than any males. The longest ♀ was 10 and the longest

♂ 8½ inches. Ventrals, ♂ 116 to 124 (127?), ♀ 123 to 128. Subcaudals, ♂ 27 to 33, ♀ 25 to 28. The scales are 15 in the whole body length. The eye is black, and the pupil not discernible in life.

Colour.—The dorsal brown colour varies. It is usually dark, and at times almost black. The scales are outlined with black in specimens of a lighter hue. The belly in all is uniform berry-red, much the tint of a raspberry. Beneath the tail the hue is darker, and in the neck becomes yellow, or dull orange.

My wife encountered one on our garden path after dark, discerning its form in the moonlight. It remained perfectly still for a minute or so till I arrived with a lantern. Even then it made no attempt to escape, but lay quiet and extended. It made little, if any, resistance to capture and when taken indoors, moved about not uneasily in my grasp and with little show of timidity. It was only 7½ inches long and quite an attractive little creature in its manners.

It is one of the commonest snakes about Shillong. One man brought me in eleven specimens in one day, which, he said, he had found beneath stones. It is probably the most diminutive species among our Indian representatives of this family.

Rhabdops bicolor.

Seven specimens, 5 ♂, 2 ♀. The largest was a ♀, 2 feet and 2⅝ inches long. Ventrals, ♂ 209 to 217, ♀ 195 and 196. Subcaudals, ♂ 73 to 79, ♀ 63 and 71. All the specimens accord well with Boulenger's description (Catalogue, Vol. I., p. 301), however, no labial touches the eye, except in one example, where the 3rd just finds contact. Suboculars intervene above the labials, that above the 3rd when distinct from the præocular being usually very small. The anterior sublinguals touch 4 (not 3) infralabials. The scales are 17 in the whole body length.

It is a singular snake in many shield characters and especially in the possession of a single broad internasal and a similar single broad præfrontal, and on this account alone is probably unique among our Indian snakes. The labials 5 with the 5th very long and none touching the eye normally are also remarkable. The posterior sublinguals are separated by one or a pair of small scales. In many shield characters it is so different from the only other species classified with it in this genus that I think it extremely probable it will have to be separated and relegated to a genus by itself.

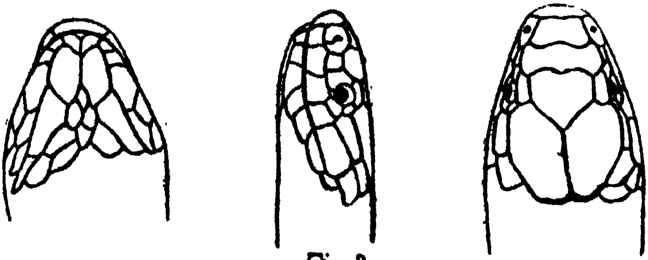

Fig. 3
Rhabdops bicolor
(× 2)

Anomalies.—In one specimen the præfrontal is divided into 3 subequal shields placed transversely, but this specimen in other respects so completely accords with my other examples that I consider there are insufficient grounds for making it a species apart. In one ♀ the last two subcaudals are entire (*i.e.*, 70th and 71st).

This snake bears a remarkable superficial resemblance to certain homalopsids, *viz.*, *Hypsirhina enhydris* and *H. plumbea*, and even a greater likeness to *Helicops schistosus.* It is uniform glossy olive-brown, or olive-green dorsally, the last 3 costal rows and the underparts being bright yellow.

Food.—One example contained a large earthworm "in gastro". One that was brought in alive, and seemingly unhurt, allowed itself to be handled freely without betraying fear or attempting to escape. When teased, it coiled up, hid its head, and refused to move, even when smartly tapped on the tail, or pinched sufficiently to cause pain. It was a most inoffensive little creature.

Blythia reticulata.

Three examples, all ♂. Ventrals, 122 to 132 (?) Subcaudals, 23 to 25. The largest measured 9⅞ inches, and this species ranks among our smallest representatives of this family, probably *Trachischium monticola* alone successfully emulating it for this distinction.

The scales are 13 in the whole body length. The eye in life is a black bead, no pupil being discernible. In colour it is blackish dorsally, but, if closely viewed, a sparse punctiform mottling may be seen in the middle of each scale. The belly is uniform black.

I encountered one in broad daylight crossing a jungle road. It made no attempt to escape, but lay extended, and when captured and handled, evinced no seeming uneasiness, offering no resistance. It was a very quiet attractive little creature.

Lycodon fasciatus.

Thirteen specimens, 6 ♂, 7 ♀. The longest was a ♀, 3 feet and ¾ inch, but a ♂ nearly equalled it measuring 3 feet and ¼ inch. The smallest specimen was 8½ inches in length.

The scales in this species are 17 anteriorly, 17 in midbody and 15 posteriorly, and the reduction is effected by an absorption of the 4th row above the ventrals into that above or below. Ventrals, ♂ 201 to 208, ♀ 206 to 213. Subcaudals, ♂ 77 to 79, ♀ 74 to 80.

Food.—Two examples had recently fed. In one instance a skink *Lygosoma indica* had been taken and in the other probably the same species.

Breeding.—The smallest specimen, 8½ inches long, was, I believe, a hatchling, and was found in a nursery on the 19th of September in the same house from which I had obtained an adult ♀, 2 feet and ½ an inch long, on the 16th of August. If my surmise is correct, here again, the breeding season is notably late, if comparison is made with *Lycodon aulicus* in the plains.

The anal glands secreted a copious custard-like material, which was found as abundant in the hatchling as in adults.

I found the slough of a snake, undoubtedly of this species, adhering to the irregularities in the bark of a pine tree of considerable girth, (about 18 inches diameter). It was situated at least five feet from the ground, with no intervening branches. The position served to indicate that this species is as deft a climber as others of the genus *Lycodon*—a conclusion that, I think, might have been inferred from the angulate character of the ventral shields.

The iris is heavily flecked with grey, a colour I have never seen in any other snake as far as I can remember, and the fact that it is visible at all seems to me sufficient justification for doubting whether this species is properly included among the genus *Lycodon* (where the iris is invisible and the whole eye like a jet bead).

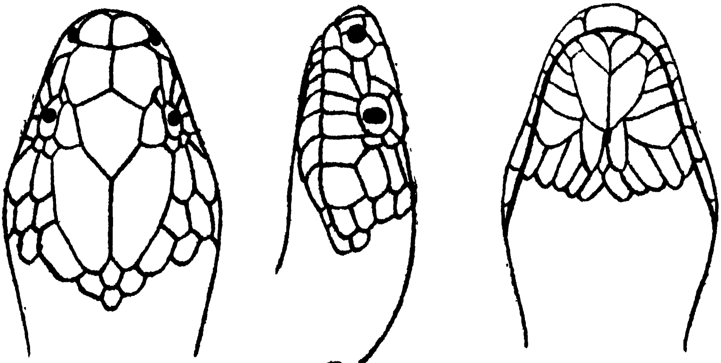

Fig 4

Lycodon.
fasciatus.
(× 3)

All my specimens were annulated with black in their entire length, the bands numbering from 32 to 38 on the body and 15 to 20 on the tail. The black is glossy, and many of the anterior, and posterior bands are complete ventrally. They are broader anteriorly, involving about 9 or 10 scales vertebrally ; narrower posteriorly, involving 3 or 4 scales. Their outlines are very irregular, though well defined, and the intervals are wheat or dove coloured. In colouration it very closely resembles members of the genus *Dinodon*, with most of which I am very familiar. It especially reminds me of *D. japonicus.*

Zaocys nigromarginatus.

One specimen only, a very fine ♀ 6 feet 6¼ inches long ; the tail 1 foot 11 inches. Ventrals, 201. Subcaudals, 130 (?) (the tail perhaps slightly docked). The scales were 16 anteriorly, 16 in midbody, and 14 posteriorly. The reduction from 16 to 14 arose from a confluence of the 2nd and 3rd rows above the ventrals, and occurred very close to the mid point of the body.

The secretion of the anal glands was blackish, an unusual colour I have hitherto only seen in the Kraits (*Bungarus*).

It is difficult to realise from museum specimens the extreme beauty and brilliancy of colouring of many snakes in life, and this forcibly applies in the present instance. My specimen was a bright green of so soft a hue that the skin looked like velvet. This merged into yellowish-green anteriorly, and yellow posteriorly, the latter merging into a rich black on the tail. The black margins to the scales served to enhance the beauty of the dorsal green. The head was olive-brown with a bright yellow patch low on the temporal region. The chin and throat were white, sparsely speckled at first, more heavily later, with light cerulean blue, which merged to blue-green, then pale greenish, and, finally, yellow in the length of the snake. Some grey speckling was seen beneath the tail.

Zamenis korros.

Two specimens. A ♀ 5 feet 3½ inches long, the tail 1 foot 10¾ inches. Ventrals, 178. Subcaudals, 145. The scales in this species are 15 anteriorly, 15 in midbody, and 11 posteriorly. In the reduction from 15 to 13 the 3rd row above the ventrals disappears, being absorbed into the 2nd or 4th rows. In the step from 13 to 11 the same absorption occurs.

On the 16th of September I saw two specimens on the Ghat road below Shillong (4,500 feet). The first, about 4 or 5 feet long, was lying by the side of the road, in an attitude of attention with head and forebody erect, gazing at me, and remained so long enough for me to make a swift dart at it. I caught and examined it, fixed its identity, and then released it. The second I met face to face, but failed to capture. It was gazing out of a low bush, and on sighting me withdrew with great alacrity, and disappeared.

Coluber porphyraceus.

Three specimens, 1 ♂, 1 ♀, and the sex of one was not determined. The ♂ was 2 feet 11 inches long, the ♀ of similar dimensions. In the ♂ the tail was ½ inch longer than in the ♀. The scales in this species are 19 anteriorly, 19 in midbody, and 17 behind. The reduction from 19 to 17 is brought about by the fusion of the 4th and 5th rows above the ventrals.

The secretion of the anal glands is brown in colour. All these specimens were dark, and of a peculiarly handsome hue, much resembling that of raw beef. I mention this, because it is not unusual to meet with light specimens in which the prevailing hue is somewhat of a dove colour.

Coluber radiatus.

One specimen, a ♂, 4 feet 5 inches long, the tail 10½ inches. Ventrals, 237. Subcaudals, 93. Peculiar in having a single postocular on both sides. The scales in this species are 19 anteriorly, 19 in midbody, and 17 posteriorly. The reduction from 19 to 17 is caused by the coalescence of the 4th and 5th rows above the ventrals. It had eaten a mouse.

Oligodon dorsalis.

One specimen, a ♀, 1 foot 2¼ inches in length (the tail 1½ inches). Accords in all particulars with Boulenger's description of this species (Catalogue, Vol. II., p. 241), except in the number of the subcaudals. Though the difference in the number of these shields in my specimen, *viz.*, 28, and the number given in Boulenger's description, *viz.*, 37 to 51, is considerable, and the importance attaching to these shields in this genus is great, I do not feel justified in claiming for my specimen specific identity on this solitary ground.[*] The ventrals are 185.

Prior to this I had found another example of this species in a very mutilated condition on the Ghat road, which I was unable to identify. The few scale characters that could be made out with certainty exactly accorded with my second specimen, including the colour and markings, which are very distinctive. It was a ♀, and egg-bound, two eggs, which from their size must have been nearly matured were extruded from the belly. The specimen was about the same length as the second one to which I have alluded first. The subcaudals were 29.

The scales in my perfect specimen were 15 anteriorly, 15 in midbody, and 13 posteriorly. The reduction from 15 to 13 was occasioned by a confluence of the 3rd and 4th rows above the ventrals. This arrangement of scales is typical of most of the genus *Simotes*. At least I have hitherto found it so, but I have not had access to every species known. On the other hand, I have previously found that the species belonging to the very closely allied genus *Oligodon*, with one exception known to me, *viz.*, *venustus*, preserve the same number of rows in their entire body length. I think it still remains to be conclusively shown that some of the species now assigned to these two genera are not misplaced. I still expect to find that *O. venustus* has better claims to rank with *Simotes* and that *dorsalis* should be considered likewise a *Simotes* rather than an *Oligodon.*

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[*] Since writing this I have received a specimen through Mr. Millard from Mansi Katha, Upper Burma. It is a ♂, the ventrals are 166, and the subcaudals 46, and it is perfectly clear to me now that the low numbers of subcaudals in my Khasi specimens are of sexual import only.

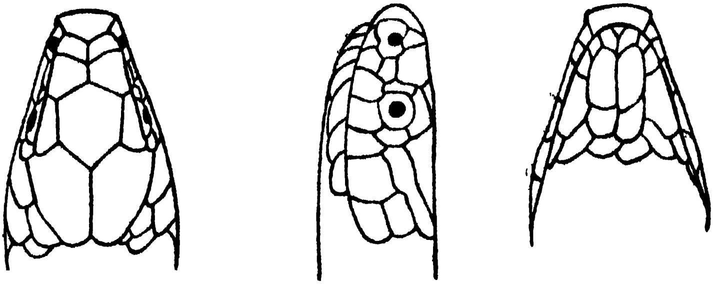


Fig. 5
Oligodon dorsalis
(× 3)

My specimen has a handsome light vertebral band from the nape to the tail tip of a colour like what is called a light chestnut in equines. This is well defined by black lines running down the row adjacent to the vertebral. The outer half of this same row, and the whole of the row below are dark cigar-brown. The rest of the dorsal aspect is blackish, with a black line running along the confines of the 2nd and 3rd rows above the ventrals. The head is finely speckled with black. There are two conspicuous black belts on the tail—one basal and one subterminal. The belly is richly ornamented with stripes of jet-black and enamel-white, occupying the whole or half the width of each ventral, and irregular in distribution. The tail beneath is bright yew-berry red, unspotted and unbanded, and very similar to that seen in *S. cruentatus.* It is a very handsome little snake.

Ablabes frenatus.

Three specimens, all ♂. The largest 2 feet and ½ an inch. Ventrals, 154 to 155. Subcaudals, 95 to 97. The scales are 15 in the whole body length.

The secretion of the anal glands is custard-like.

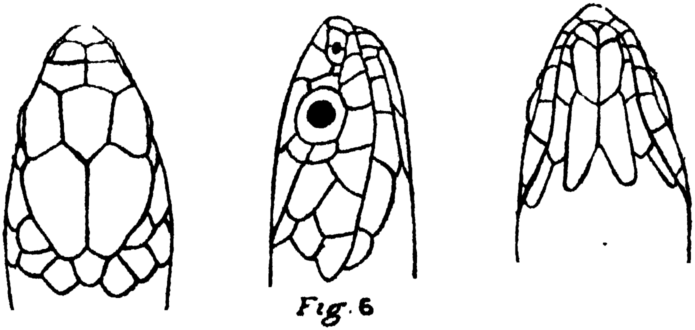


Fig. 6
Ablabes frenatus
(× 1)

Anomaly.—Two temporals on one side in one specimen.

They are all olive-brown, and apparently uniform in colour till one separates the scales when their edges and interstitial skin are seen to be alternately black and white, excepting the last row which is black both above and below and the vertebral which is black on both edges.

Subfamily 5.—Dipsadomorphinæ.

Dipsadomorphus cyaneus.

One ♀ specimen from Nongpho on the Ghat road (1,800 feet). Length, 4 feet 2 inches; the tail 1 foot and ¼ of an inch. The scales are 21 anteriorly, 21 in midbody and 15 posteriorly. The first reduction from 21 to 19 is effected by the absorption of the uppermost costal into the vertebral; in the next from 19 to 17 the 3rd and 4th rows above the ventrals blend; and the last step from 17 to 15 is the same as the first. The first and second steps occur close together.

The posterior sublinguals are quite separated (an important point in assisting the division of this genus into species). The anal glands when pressed squirted out an extremely fine jet of thin limpid secretion, similar to what I have observed in some vipers, but, as far as I can recollect, not in other colubrines. This fluid was very abundant, and possessed a peculiar odour neither agreeable nor offensive.

The specific name *cyaneus* is not appropriate since the creature in life is green. In this specimen the hue, though not bright, was certainly one covered by the simile foliaceous-green. This colour very rapidly disappears in spirit. I preserved my specimen in whisky for want of another agent, and within 24 hours a decided change of colour to blue had taken place, which makes me think it probable that the godfathers (Dumeril and Bibron) did not see the type specimen in life.

Psammodynastes pulverulentus.

18 examples, 9 ♂, 8 ♀, 1 unsexed. The largest a ♀, 2 feet and $\frac{3}{4}$ of an inch. Ventrals, ♂ 158 to 166, ♀ 160 to 173. Subcaudals, ♂ 52 to 68, ♀ 53 to 65. The scales are 17 anteriorly, 17 in midbody, and 15 posteriorly. The reduction from 17 to 15 is due to an absorption of the 4th row above the ventrals, either into the row above or below.

Food.—Lizards and frogs. I found the following lizards "in gastro," *Ptyctolœma gularis*, *Lygosoma indica*, on two occasions, and a tail which from its length and colour probably belonged to *Calotes jerdoni.* The frogs taken on two occasions were too digested to identify.

Breeding.—A small specimen, 7½ inches long, is evidently this year's production. It was brought in on the 21st September, but I am unaware as yet of the length of the young at birth, another 8¼" long was obtained in October (I have lately in this Journal reported the viviparous habit of this species).

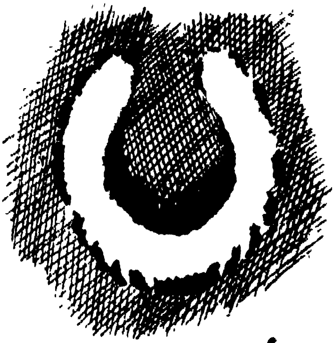
A ♀ on the 18th September contained some ovarian follicles which appeared to me from their colour and size to be impregnated, and another on the 19th September led me to the same conclusion. In the latter some of these measured $\frac{8}{20}$ of an inch.

If my assumption is correct, it is a remarkable circumstance. I met with one specimen only in my walks abroad, though it is one of the commonest snakes about Shillong. I succeeded in capturing it after some trouble, as it made strenuous efforts to evade me, and showed much activity and spirit. Knowing well the character of the species I was dealing with, I had to treat it with due respect and caution.

Subfamily 8.—ELAPINÆ.

Naia tripudians.

A ♀, 5 feet 2 inches long, was brought to me on the 18th August. Ventrals, 187. Subcaudals, 52. The scales were 25 anteriorly, 23 in midbody, and 15 posteriorly. Colour uniform olive-brown. The hood-mark as shown in the accompanying figure is a modification of the monocellus typical of variety *fasciata* (Gray).



Hoodmark of
Cobra
(N. tripudians)

I may here remark that three different people in Shillong independently told me that a month or two before my visit a juggler had come round having in his possession a perfectly uniformly bright green cobra. I can find no reference to such a colour variety in the literature on this snake. I tried to trace this man, but he had evidently left the place, so that I could obtain no information as to where he obtained the specimen. Singularly enough the first time I had ever heard of such a colour variety was a week or two before my visit to Shillong. My informant was Mr. W. Tottenham, Conservator of Forests, who mentioned that he had once met with such a specimen in North Siam at a place called Nan on the Mekong River. He described it as erecting its hood and behaving in every way like a cobra, differing only in its colour from usual specimens.

Naia bungarus.

The "Bsein yong" of the Khasis, meaning black snake. A single ♀ 6 feet 6½ inches was brought to me on the 21st September. It was reported to have been seen entering a house close to the Shillong bazaar early in the morning, and was pursued, and killed. Ventrals 254, subcaudals 88, the first 12 entire, the rest divided. The scales were 17 anteriorly, 15 in midbody and 15 posteriorly. The step from 17 to 15 occurred just after the site I select for numbering the scales anteriorly, *viz.*, two heads lengths behind the head, and the reduction was due to the absorbtion of the 4th row above the ventrals, into the 3rd on one side, the 5th on the other.

The supracaudals were everywhere in even rows, a matter for remark. In almost all other snakes where the subcaudals are entire the supracaudals are in odd rows (vide *Bungarus*), and where the subcaudals are partly entire partly divided, the supracaudals are in odd rows corresponding to the entire, and in even corresponding to the divided subcaudals.

The secretion of the anal glands was like white paint in colour, and consistency.

It was quite black dorsally, but when the scales were separated, the light bands, often so conspicuous on this creature, were seen to be present though obscure. The head was brown with black sutures, and the throat a dull orange. At first sight it bore a remarkable superficial resemblance to a dark specimen of *Zamenis korros*, but was also so much like a black cobra that many I think might have been deceived.

Whilst out butterfly catching on the Ghat Road below Shillong (circa 3,000 feet) I encountered one of a somewhat similar length, and ound myself suddenly at uncomfortably close quarters to it. Having dismounted to secure a specimen I wheeled my bicycle to lean it against the bank of the cutting, when within a foot or so of me I became aware of the snake as it lay extended in the drain some eighteen inches or so deep. It appeared to be drinking in the trickle of a stream diverted into this channel. It reared its head, faced me for an instant, during which time I distinctly viewed its head shields, and made off into the jungle at about the moment when I had realised its identity. This specimen was quite black. A fatality which occurred in Shillong this year prior to my visit I think there can be little doubt must be attributed to this species. My informant was Mr. Rita, who could vouch for the following facts. Hearing one afternoon about 3 p.m. a great commotion near his house, enquiry elicited the information that a party of 30 coolies was in the act of removing the carcase of a pony belonging to a native neighbour. Mr. Rita had actually seen this pony alive and well in its stall about 12 p.m. the same day. He was informed that it had been attacked by a large snake which was seen twined round the animal's neck by servants who fled precipitately, so that the reptile escaped without any attempt being made to kill it. The pony died shortly afterwards with great swelling about the neck and shoulders, and the carcase was already highly offensive when the coolies were removing it.

Callophis macclellandi.

12 specimens, 8 ♂, 4 ♀. All were adults varying from 1 foot 3¼ to 1 foot 11¾ inches. Ventrals: ♂ 188 to 201, ♀ 209 to 216; subcaudals: ♂ 28 to 32, ♀ 26 to 30. The scales in this species are 13 in the whole body length.

Anomalies.—In a previous paper in this Journal* I have remarked upon the contact of the 3rd supralabial with the nasal in the genus *Callophis*, a peculiarity seen only in the allied genera *Doliophis, Hemibungarus* and *Naia*. My series of specimens of *maclellandi* shows me that the contact of these two shields is not invariable, in fact failed in 4 specimens. This being so one must be prepared for a possibly similar inconstancy in other species of these genera. In one specimen the 3rd, 4th and 5th labials touched the eye and in another the 4th and 5th subcaudals were entire. I find the pupil in this species is often indiscernible, but in some specimens a small arc of ruddy gold may be seen.

The secretion of the anal glands is custard-like.

All specimens conformed to Boulenger's variety A. (Catalogue, Vol. III, p. 399). This is a remarkably handsome species, the shade of red on the back is much like that of fresh raw beef, sometimes rather brighter and in all specimens lighter and brighter in the flanks, where it is often a bright carrot-red. The black bands from 16 to 26 on the body and 3 to 4 on the tail are always narrow, involving about 2 scales. They are usually but not always outlined with pale yellow, or buff, and are interrupted slightly in the flanks, on the last row and the edge of the ventrals, but re-appear, and extend across the belly. The head is glossy jet-black with a well defined enamel white cross bar. In one specimen this bar was pale yellow. The belly is sulphur yellow, and the intervals between the bands heavily marked with irregularly-shaped black patches.

The two or three specimens I saw alive lead me to think it is a very quiet inoffensive little snake. I could not provoke them to exhibit temper in spite of much teasing.

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* Vol. XVII, p. 56.

Family—AMBLYCEPHALIDÆ.

Amblycephalus monticola.

Three specimens, all ♀; two were adults, the largest 2 feet 5½ inches, the third one of this year's production measuring 8⅛ inches, was brought in on the 12th September. Ventrals 189 to 195, subcaudals 76 to 78. The scales are 15 in the whole body length. The præocular touches the internasal, a very unusual character, as far as I am aware only to be seen in *Naia tripudians*, and some specimens of *Xylophis perroteti* among Indian snakes. In midbody the vertebral scales are seen to be much enlarged, quite as broad as long, and this enlargement is found to originate in the neck by the confluence of two rows of scales, similarly to what obtains in the genus *Dendrophis*, but different from the genus *Bungarus* where the enlargement is progressive from behind the parietals. Boulenger (Catalogue, Vol. III, p. 443) records the supralabials as 7, the 3rd or 3rd and 4th touching the eye. In all my specimens no labials touched the eye.

The secretion of the anal glands is custard-yellow.

The iris is profusely speckled with mustard-yellow.

In life the prevailing ground colour is a dull orange, much the shade of dried orange peel.

Food.—One adult had swallowed a large slug; the other adult contained two large specimens of the same slug "in gastro." The slugs were sent to the Indian Museum, and identified as belonging to the genus *Auchenia.*

Family—VIPERIDÆ.

Lachesis monticola.

The "B'sein longkru" of the Khasis. 23 specimens, 2 ♂, 15 ♀, 6 not sexed. The two largest both ♀ measured 2 feet 3¼, and 2 feet 4⅜ inches. Ventrals: ♂ 142 to 143, ♀ 144 to 151; subcaudals: ♂ 45 to 46, ♀ 37 to 46. Of 18 specimens in which the scales were examined they were as follows:—

Number of specimens.	Anterior.	Midbody.	Posterior.
11	23	23	19
2	23	23	17
1	25	25	21·20
1	25	25	19·17
1	21	21	17
1	21	22	19
1	23·21	21	19

In no specimen was a subocular shield present, and this is the easiest guide to the identification of the species. In view of the fact that Anderson has recorded two examples in which the 2nd supralabial did not enter the loreal pit[*] I paid special attention to this very important point in identification, which I have always found most constant in all the species. There was no exception to the rule among my specimens, but more than once this shield appeared to be divided. A closer scrutiny proved the apparent division to be merely a furrow, not a suture, and this has led me to wonder if Anderson might have been mistaken.

Anomalies.—The 2nd subcaudal was entire in one example, and the last 4 in another.

Food.—Only one had recently fed, a young specimen 11½ inches long which had swallowed a mouse.

Breeding.—8 specimens were this year's production varying from 7⅝ to 9⅞ inches in length.

The anal glands secrete a watery, limpid, fluid which is stored in considerable quantity. Pressure at the base of the tail causes this to squirt out in a fine jet such as issues from the needle of a hypodermic syringe. It possesses a peculiar but not exactly an offensive smell, resembling in some degree that of resin. In a specimen 11½ inches long I found the secretion similar to, and as abundant as in adults.

It is one of the commonest snakes, and quite the most abundant poisonous species occurring about Shillong. Like many other vipers it is truculent, striking upon small provocation, and it evidently frequently wounds the naked feet of the incautious native pedestrians in this locality. My snakeman in trying to effect the capture of an adult he found in a deep hole was bitten in the finger. He suffered immediate and severe pain, and the hand and arm even to the loose tissues below the armpit swelled rapidly, and considerably. Blood continued to ooze for a long time (hours), and that shed did not clot. He suffered from a severe local hæmorrhage the next day, but although his blood was materially altered in composition, no constitutional effects, nervous or other, supervened, and he recovered in three or four days, and volunteered his services as a snakecatcher again. The medical aspect of the case and treatment were fully reported by me in the Indian Medical Record. (Nov. 1907.)

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[*] Ann. Zool. Res., Yunnan, pp. 832 and 3.

This appears to be the only record of a case poisoned by this snake if we except the instance recorded by Stoliczka * where a cooly was wounded by a small specimen 14¼ inches long. This case one may infer was one of snakebite, not snake poisoning, since the man is reported to have been dosed with alcohol, and continued marching the rest of the day with no ill effects.

Another cooly who brought me two specimens one morning told me that he had just been bitten by one, and I saw a slight wound on his right ankle from which blood was oozing, and the surrounding parts were slightly swelled. He had placed a single cord rather tightly above the wound, refused my proffered surgical attention, and showed no apprehension, telling me the snake was a harmless one. A few days later I saw him, and he said he had suffered very little in consequence. The wound was healed, and he told me he had applied ginger to it after infliction.

I played with one large adult brought alive. I found its movements in progression slow, but when it struck, the blow was delivered with great alacrity. Teased with ordinary objects, a handkerchief, a stick, &c., it showed supreme indifference, but when I suddenly altered my position from an upright to a squatting one, although at a safe distance, it struck out towards me with great malice and celerity. This it repeated several times though it could not be provoked to bite inanimate objects. My thoughts reverting to a passage in Buckland's Work "Curiosities of Natural History" (p. 215) which reads as follows:—"That the Arabs wore red buskins, and drawers, with the evident purpose of exciting, and teasing the snakes, who can't bear this colour near them, and as in the case of the common viper always fly at it when brought into contact with them"—I thought the present a good opportunity to test the accuracy of the assertion.

Accordingly after having teased it with many other agents, I brought my child's toy engine coloured vermilion into action. This was advanced towards it at varying rates of speed, but although the creature lay facing it, it neither retracted nor turned its head but

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* Journl., Asiatic Soc., Bengal, Vol. XXXIX, pp. 224 to 226.

allowed the wheels to come into contact with, and even override and rest upon its coils without betraying fear or annoyance. An equal degree of contempt was manifested with dahlias of various shades of red.

Lachesis jerdoni.

A single small specimen.

Lachesis gramineus.

Three specimens, 2 ♂, 1 ♀. Ventrals: ♂ 158 to 171, ♀ 156; subcaudals: ♂ 64 to 65, ♀ 57. The scales in all were alike and conformed to the arrangement of the vast majority of specimens of this species. Anteriorly and in midbody they are 21, posteriorly 15. The three reductions in the rows from 21 to 15 are somewhat variable, but arise from a confluence of the 4th to 7th rows above the ventrals.

In one specimen the postocular streak was particoloured, white below, liver above. At the angle of the mouth these two hues were reversed and carried down the whole body as a flankline along the last costal row.

NOTES ON INDIAN FERNS.

BY

COL. R. H. BEDDOME.

Having lately received a large collection of ferns from the North-West Provinces of India to name, I have been going through all my Indian ferns, and been studying Mr. Hope's articles on the ferns of North-West India which appeared in your Journal. I have drawn up a few notes chiefly on Mr. Hope's nomenclature and his new species which, I think, may be published in your Journal as they may be of interest to collectors in India.

Davallia (*Leucostegia*) *Beddomei* (Hope).—This fern has the scales of the rhizome rounded like those of pulchra. The fronds are not distinguishable from those of Hookeri (Moore), which has the scales pointed. It seems to me rather hair-splitting to found a species only on the difference of scales. Indian botanists should further compare these species. The localities for Beddomei are: Dainkland ridge 8,500′, Macdonald; Kullu, Jalori pass 8,000′—10,000, Trotter; Jaranda 7,000′, Lace; Simla region 8,000′—10,000′, Blanford and others; for Hookeri, Chamba 10,500′, J. Marten; Sandookphoo 11,000′, Levinge.

pulchra, Delavayi, pseudo-cystopteris, Hookeri and Beddomei are all very closely allied.

Asplenium (*Athyrium*) *tenellum* (Hope).—Specimens of this forwarded to me by Mr. Hope agree exactly with specimens of *Athyrium solenopteris* (C. P. 3,067) from Ceylon, specimens of my own collecting from Tinnevelly, and specimens from Mr. Mann collected in Assam; they all have setæ on the pinnules as in nigripes and its varieties. Mr. Thwaites called his plant simply nigripes. It seems to run more or less into tenuifrons which is generally considered only a variety of nigripes, so I am now of opinion that solenopteris should also come under nigripes as a variety only. Wallich's specimen in the Linnæan Herbarium labelled *Allantodia tenellum* is not however this variety but only a poor specimen of nigripes var. incisa. There is a larger variety of this solenopteris common on the Nilgiris, *i.e.*, the fern figured as solenopteris in my hand-book and described by Kunze in Linnæa, Vol. XXIV, part III, page 266, the smaller form being variety pusilla, Kunze, page 267, but I think they quite run into each other.

This fern is quite distinct from pectinatum var. tenellum of my hand-book, a fern found on Mahableshwar, at Mt. Abu and in Central India.

Athyrium rupicola (Edgeworth), Hope. This attenuated form of *A. Filix-femina* is very common in Northern India, it is very variable in size and shape though always more or less lanceolate or narrow-lanceolate in form. It is quite analogous to forms occurring in England such as var. rhæticum and others; in the supplement to my hand-book, I referred some of these to var. attenuata (Clarke) and others to var. retusa (Clarke). I now think that they all run very much one into the other and there are connecting links with var. dentigera.

Indian pteridologists would be doing good service if they would study and make notes on this genus; the species are the most difficult to name of all Indian ferns, the reason of this is that there is no good treatise of the Indian species yet published. It is about the varieties of Filix-femina and nigripes that the chief difficulty lies. I have previously pointed out that *Athyr Atkinsoni* var. *Andersoni* (Clarke) is *Athyr fimbriatum*. I now think that Atkinsoni of my hand-book is only a more simple form or variety of that species, I would ask Indian botanists to give attention to this question. Various localities for Atkinsoni are given in my supplement.

Athyrium Mackinnoni, Hope. This is the least cut form of the Indian deltoid nigripes. My description at page 166 of the hand-book includes this and also the more cut variety incisum, Wall Cat. 231 (which is almost the same as Blume's nigripes from Java), a form so abundant about Darjeeling and Surail. Hope's Mackinnoni is also the high level form of nigripes of Mr. Blanford's list, the other form being tenuifrons. Mr. Clarke also collected it at Cherra Coalhill [No. 42788], if his specimens are compared with the more cut form (var. incisum) it will at once be seen that they are the same species, with only a slight difference in cutting; I have also many specimens from high levels near Simla collected by Blanford, Dr. Jukes and others. Another variety is dissectum [Moore] collected by Mr. Mann at Serareen, Khasi Hills; this is slightly more cut than incisum and is scarcely deltoid in form but the difference is very slight. The nigripes group may stand as follows:—

Athyrium nigripies, Bl., (Syn. *Mackinnoni*, Hope). Simla region 8,000′—10,000′ Chamba 8000′, Khasi 5000′.

- Var. incisum, Wall. Cat. 231. Sikkim, Darjeeling, etc.
- Var. dissectum, Moore. Khasi Hill.
- Var. tenuifrons, Wall. Cat. 206. Northern India, Simla, etc.
- Var. solenopteris, Kze, and var. pusilla. Ceylon, Southern India, Northern India, Assam, etc.
  - (Syn: aspidioides in part, Hook, Syn. Fil. page 228, tenellum, Hope).
- Var. clarkei, Bedd. Hand-book, 166. Sikkim.
- Var. stramineum, Moore, Index, Fil. 188. Assam.

A very fine Athyrium, apparently a new species, has been lately collected by Dr. Jukes, C.M.S., at high elevation on Huttu, Simla region, as it wants both stipe and rhizome I do not like to describe it as new, but there is nothing like it in the Kew Herbarium or in my very large series of specimens of the genus. The frond without stipe is 26 inches long by 20 inches broad, not deltoid in shape, as the 2 lower pairs of pinnæ are reduced in size, the lowest pair being only half the length of the next pair; the cutting of the ultimate segments is sharp like that in schimperi but the pinnæ are much broader and more compound. It is important to ascertain if the rhizome is creeping or erect.

On the question of creeping or erect rhizomes the attention of botanists in the field is much needed. Is the difference always specific, or is a creeping rhizome ever brought about only by such causes as very wet ground, or very rich loose soil, etc.?

Polystichum Duthiei (Hope).—This is *Polystichum lachenense*, Hook. Hope says the pinnæ are never spinulose as figured by Hooker. I have 2 specimens of this, received from Dr. Duthie collected above Chimpul at 15,000′ elevation ; in one the pinnules are bluntly crenate as figured by Hope, in the other spinosely-serrated as figured by Hooker. Mr. Hope would never allow for any variation in ferns, but wished to make a new species where the slightest variation occurred.

Lastrea Gamblei (Hope).—This fern, which is common on the Nilgiris as well as in the North, is atrata, Wall. Cat. 380, fully described by Kunze in Linnæa, XXIV, part iii, p. 279, as *Aspidium* (*Nephrodium S. Lastrea*) *atratum*, Wall.. Kunze stating that it is very closely allied to hirtipes. It is only a black-scaled variety of that species, botanists of late not even considering it worthy of a varietal name ; if such is necessary it should be hirtipes var. atrata, Wall.

Lastrea repens (Hope).—This is the cana of Baker and of my hand-book though not, I believe, of Wallich ; it is appendiculata, Wall. Cat. 349, type sheet, and eberneum, Wall. Cat. 389, type sheet. Until quite lately when it was found to have a widely creeping rhizome, it has been confounded with ochthodes (prolixum, Baker, in part) which is a very similar fern but with an erect caudex and furnished with glands at the base of the pinnæ. This cana was also figured by me, pl, ccclxx, Supplement to the Ferns of Southern India and British India under the incorrect name of Bergiana Schl. ; the lower pinnæ are sometimes though not always reduced to auricles. A new name as proposed by Hope is quite unnecessary.

Lastrea Kingi (Hope).—I cannot distinguish this from serrato-dentata ; the very slight difference pointed out by Hope is not sufficient to constitute a species. For me they are both only variations of the very variable filix-mas.

Lastrea Blanfordi (Hope).—This is, I think, only a more simple form of the fern Mr. Hope calls ramosa. Blanford and others never attempted to separate it from that species.

Lastrea ramosa (Hope).—This is the fern we have hitherto known as spinulosa var. remota. Mr. Hope may be right in separating it specifically from the European form, but I should be sorry to give a decided opinion on the question. It is one of those critical points on which botanists seldom agree. I myself still keep this fern under remota, seeing only slight variation from the European form.

Nephrodium papilio (Hope).—I have no hesitation in saying this is only a form or variety of molle, as I have examples quite intermediate. It is var. major of my supplement.

Nephrodium occultum (Hope).—This is the fern I have described as papyraceum at page 69, supplement to hand-book. I am afraid it is scarcely specifically distinct from aridum.

Phegopteris late repens (Hope).—This is a question where the importance of the rhizome comes in, distans Don Fl. Nep. 2; paludosum, Blume Fl. Jav. Fil. 192 to 90; Griffithii, Hook, Sp. Fil. IV, 236; longipes, Wall. Cat. 333, have all been grouped together under distans as one species, they do not appear to differ as far as the frond goes, but Hope's plant has a widely creeping rhizome like that of *Gymnogramme aurita*, can it be a form of that fern without the auricles, or is it one or more of the species brought under distans and is the creeping rhizome constant, whilst distans, Don, has it erect, this is a question for Indian botanists (who can examine the plants growing) to decide, or is the rhizome creeping only under certain conditions Specimens I have of Clark's distans var. glabrata and var. minor have a decidedly erect caudex. None of the others have the rhizome represented in my herbarium or in that of Kew, though I feel sure the Nilgiri and South Indian forms have an erect rhizome. I have only seen one specimen of Hope's fern, it was gathered by Mackinnon at Phedri Gurhwal, 4,500′ elevation, it is not separable by its frond from what we call distans; Hope does not even hint that his fern is a new species, so we do not want another name added to the already numerous synonyms. Mr. Clarke at page 544 of his Review of the Ferns of Northern India says of distans "very difficult to distinguish from *Gymnogramme aurita*," see also remarks under Gymnogramme at page 24, Supplement to Ferns of Southern India and British India.

Polystichum auriculatum.—Mr. Hope may be right in separating the South Indian auriculatum from the North Indian forms or varieties, I have always had a doubt on this question: the Nilgiri plant was described as *Polypodium harpophyllum*, Zenker, in Linnæ XXIV, part II. p. 356 (1851); he is however in direct opposition to Hooker and Baker in doing so; I never liked to dispute these authorities on such a critical question as this. I cannot however agree with Mr. Hope in making 3 species of the 3 North Indian varieties—marginatum, lentum and cæspitosum (obliquum, Don).

Polystichum aculeatum and *Lastrea Filix-mas.*—Mr. Hope wishes to make species of the varieties of these well known cosmopolitan ferns; in this I hope no Indian botanist will follow him, as I am sure any such course would bring about great confusion; varietal names for these forms are all very well for local Floras, particularly when it is understood that these names are given for the extreme forms only of these varieties, as it is well known that when the ferns from very large areas are examined these supposed varieties often run very much one into another; or, to put it in other words, there are various intermediates making it almost impossible to distinguish them. Of Filix-mas I may mention the varieties, odontoloma (Moore), elongata (Hook.), schimperiana (Hochst.), and panda (Clarke) as often very difficult to distinguish satisfactorily even when the collection is from restricted areas; if this species-making is allowed it is difficult to imagine what would become of filix-mas when collections from all the areas inhabits were so treated. Sir W. Hooker was the first to check the hair-splitting so much in vogue with foreign botanists, in this he has been followed by almost all English botanists. If I have a large Indian collection to name I can at once bring together all the varieties *Lastrea Filix-mas* and *Polystichum aculeatum* under those species, as they have a most unmistakeable specific likeness, but to arrange them all correctly under varietal names is very difficult and probably no two botanists would arrange them in the same way.

If botanical and horticultural gardens and growers of ferns in India would give attention to raising from spores the different varieties of *Athyrium Filix-femina*, *Athyrium nigripes*, *Polystichum aculeatum* and *Lastrea Filix-mas*—I am sure we should have very interesting scientific results.

LOCAL BIRD-MIGRATION IN INDIA.

BY

D. DEWAR, I.C.S.

On page 520 of Vol. XVII of the Journal of this Society I drew attention to the fact that the Common Bee-eater was only a summer visitor to Lahore. I am now in a position to name other birds which are stated in most ornithological text books to be permanent residents, but which, so far as Lahore and its vicinity is concerned, are merely summer visitors; every spring they come to Lahore to breed and then leave the place. The following is, I believe, a complete list:—

Oriolus kundoo.—The Indian Oriole.
Terpsiphone paradisi.—The Indian Paradise Flycatcher.
Gymnorhis flavicollis.—The Yellow-throated Sparrow.
Arachnechthra asiatica.—The Purple Sun-bird.
Merops viridis.—The Common Indian Bee-eater.
Merops philippinus.—The Blue-tailed Bee-eater.
Eudynamis honorata.—The Indian Koel.
Œnopopelia tranquebarica.—The Red Turtle-Dove.
Nycticorax griseus.—The Night Heron.

(518) The Indian Oriole (*Oriolus kundoo*).—Oates writes of this (Birds, *Fauna of Brit. Ind.*, Vol. I., p. 505):—"A permanent resident in the plains and lower ranges of the Himalayas, and a summer visitor to Kashmir and the higher ranges. It extends into Afghanistan and Turkestan, but visits the latter country only in summer."

Barnes states that it is a permanent resident in the Bombay Presidency. Writing of Lucknow, Jesse says:—"The Indian Oriole though a permanent resident is very scarce during the winter months, when curiously its place is to some extent taken by *O. melanocephalus*. It becomes common about May." This species does not appear to extend so far west as Calcutta. In my list of the Birds of Madras I wrote (B. N. H. S. Journal, Vol. XVI., p. 488), "not often seen in Madras during the hot weather, but it is fairly common in the winter. It would seem . . . that this species does not nest in Madras." In Lahore it is abundant in the hot weather. I have come across many nests, and in each case a King-crow's nest has been found within a yard or two of the Oriole's nest. It is my belief that the Oriole deliberately elects to build near a King-crow's castle for the sake of the protection afforded by the pugnacious little drongo. Not that the Oriole is unable to look after itself! I am pretty certain that all the Orioles leave Lahore during the winter months, I have looked carefully for two winters without seeing a single specimen. The Black-headed Oriole is not found in Lahore. Humes writes of the Indian Oriole (*N. and E. Ind. Birds*, Vol. I., p. 354):—"In Southern and Eastern Bengal it only, so far as I know, occurs as a straggler during the cold season, and I have no information of its breeding there. It does not apparently ascend the Nilgiris, and throughout the Southern portion of the peninsula it breeds very sparingly, if at all: indeed it is just at the commencement of the breeding season when the mangoes are ripening that Upper India is suddenly visited by vast numbers of this species migrating from the South." It nests in the lower ranges of the Himalayas, up to about 4,000 feet. Dr. Scully writes:—"The Indian Oriole is a seasonal visitant to the valley of Nepal, arriving about the 1st of April and departing in August." Col. Biddulph states that it is a common summer visitant to Gilgit, appearing about May 1st. Hutton records:—"This is a common bird in the Doon, and arrives at Jerripani, elevation 4,500 feet, in the summer months to breed." Bingham writes:—"The Indian Oriole builds at Allahabad and at Delhi from the beginning of April to the end of July. In the cold weather this bird seems to migrate more or less, as but few are seen and none heard during that season." Fulton writing of Chitral says:—(B.N.H.S. Journal, Vol. XVI., p. 849) "Very common. A summer visitor arriving in large numbers during the beginning of May and leaving in August or September." It is also only a summer visitor to Quetta; the same applies to Darbhanga.

On page 258 of Vol. XV. of this Journal Ferguson cites *Oriolus kundoo* as one of the migrants that may be found in the hills and low country of Travancore from the beginning of September to the end of April, yet he seems to contradict himself by saying on page 461 of the same Journal that the bird is a permanent resident of Travancore. Major Baker describes it as a "rare visitor" to Singapore. The above facts afford to my mind conclusive proof that the Indian Oriole is a migrant, and that it migrates in a northerly and southerly direction.

Like other migrants it goes north in the summer and does not appear to nest below Lat. 10° N. In the autumn it moves southwards, and does not apparently winter farther north than Lat. 30° N.

(598) The Indian Paradise Fly-catcher (*Terpsiphone paradisi*).—On page 47 of Vol. II of "Birds" in the *Fauna of British India* series, Oates writes:—"It appears to be everywhere permanently resident, except in the Himalaya, where it moves to lower levels in winter." Jesse in his "Birds of Lucknow" calls it "a permanent resident." Barnes writes, in his "Birds of the Bombay Presidency," it is "probably a permanent resident throughout the district, but is very locally distributed." Cunningham, on page 123 of his "Indian Friends and Acquaintances," writes of this species:—"They are not very common inmates of gardens about Calcutta, but stray specimens may now and then be met with at almost any time of the year." I observed this species at all seasons of the year in Madras. There can be no doubt that the bird is only a summer visitor to Lahore. During the two winters I have spent in that station I have not seen a single Paradise Fly-catcher; while in the hot weather I have come across as many as half a dozen nests in one day, on many of which a white cock was sitting with the long tail feathers hanging down far below the bottom of the nest; a point for the consideration of those who believe that, in sexually-dimorphic species, the hen is the less conspicuously coloured because it is she alone who incubates.

Hume (*Nests and Eggs of Ind. Birds*, p. 22) writes:—"The Indian rocket-bird or Paradise Fly-catcher breeds throughout the exterior ranges of the Himalaya in the warmer valleys up to an elevation of 5,500 feet, at any rate from Nepal to Afghanistan. Even at considerable distances in the interior, as about Almora, Kotegurh, and the Sutlej Valley, Sultanpur and the valley of the Beas and Kashmir, it is common. Throughout the warm Sub-Himalayan forest tracts, in the Doon, the Terai, and the Sub-Himalayan forest tracts, northern portions of Rohilkand and Oudh, and in wooded portions of Jhansi, Saugor, Nimar, Raipur, and doubtless other portions of the Central Provinces, it breeds, though more sparingly in these latter. It breeds in Southern India, but I have scant information as to its nidification there, and neither Miss Cockburn, Mr. Davison, nor any other of my Nilgiri correspondents appear to have taken its nest there." He also records its nidification at Calcutta, Delhi, Mysore and Ceylon.

Littledale states that it is very common at Baroda during the rains when it breeds.

Fulton, writing of Chitral (B. N. H. S. Journal, Vol. XVI., p. 50), says:—" A summer visitor arriving in the beginning of May and leaving in August. Not numerous, and only ascending the valley as far as Drosh. None noted above 5,000 feet."

Ferguson says (B. N. H. S. Journal, Vol. XV., p. 235) that this species is one of the Travancore birds usually resident in the plains, but found during the hot months at considerable elevations on the hills.

Inglis, speaking of Darbhanga, writes (B. N. H. S. Journal, Vol. XIV., p. 132) " very common during the breeding season. They arrive towards the end of March and leave about the end of October." Ward states that it is " a well-known summer visitor " to Kashmir and Jammu.

The above facts seem to show that the Paradise Fly-catcher moves about a good deal, but that its migrations are very local, and appear to be chiefly with the object of avoiding extremes of temperature—above all anything approaching cold.

(775) The Yellow-throated Sparrow (*Gymnorhis flavicollis*).—According to Oates this bird occurs in the plains of India from the foot of the Himalayas down to Travancore and from Sind eastwards to about the longitude of Midnapore in Bengal also Ceylon. This species ascends the Himalayas in parts, and the hill tracts of the South of India up to about 4,000 feet. It extends westwards to Persia.

Hume states:—"The Yellow-throated Sparrow breeds pretty well throughout India, except in the extreme south and again in Orissa and Bengal. From Behar to Sind and from Dehra Dun at any rate to Bangalore it may be found nesting, I believe."

Ferguson says it breeds in Travancore.

Barnes says that it is a permanent resident throughout the Bombay Presidency. No one seems to hint that the species is in any way migratory except Inglis, who in his "List of the Birds of the Madhubani subdivision of the Darbhanga District" (p. 187 of Vol. IV of this Journal), says:—" Flocks are seen from May to October." There can, I think, be no doubt that this bird is merely a winter visitor to Lahore. It comes in considerable numbers and I must have found from ten to twenty nests, but I have not seen the bird in or about Lahore at any time in the cold weather. It is fairly common in Madras, and while there I was under the impression that it was a permanent resident, but I never found its nests and it is quite possible that it migrates from there in the hot weather. As I have said above, when in Madras I did not think of observing whether this and some of the other species with which we have been dealing left that place in summer, because I was under the impression that they were all non-migratory species.

(895). The Purple Sun-bird—(*Arachnechthra asiatica.*)

Blanford gives as the distribution of this species "the whole Peninsula of India from Cape Comorin to the Himalayas, where this species is found up to 5,000 feet, and from Sind and the Punjab to the extreme east of Assam, thence extending south through Burmah to Central Tenasserim and the Thoungyeen valley. The furthest point south in Tenasserim where this bird has been observed on the sea-board is Yay. This sun-bird also occurs in Ceylon." Hume records nests from the following localities:—Etawah, Jhansi, Saugor, Raipur, Sambalpur, Saharanpur, Dehra Dun, Almora, Murree (up to 4,000 feet), Oudh, Agra, Nalna, Allahabad, Delhi, Berar, Hyderabad (Sind), Deesa, Rajputana, Nilgiris (up to 6,000 feet), and Kurnool.

MacDonald states that it is common in Myingyan, but Stuart Baker does not include the species in his "Birds found in the Khasia Hills."

Ferguson writes that it is not common in Travancore, and that he has not met with it on the hills.

In Madras this species is rare, being almost entirely replaced by *A. lotenia.* So far as I can remember, the few occasions on which I came across this bird were in winter, but I did not pay much attention to the matter, since it never occurred to me that this species was in any way migratory. It is only since I have come to Lahore that it has become apparent that the species is to some extent migratory. From August to March not a single Purple Sun-bird is to be seen in or about Lahore. In April they arrive in hundreds, and are then to be numbered among our commonest birds. Frequently have I come upon half a dozen or more nests in the course of a short walk. At one time five of them existed in my compound. There is, then, not a shadow of the doubt that *A. asiatica* is a summer migrant to Lahore

The question is, where do these summer visitors come from? I am inclined to think that more careful observation will show that there is a general northward migration of this species each spring, and the reverse in autumn, so that in the hot weather the most southern parts of India are almost denuded of honey-suckers of this species; *A. lotenia* is, of course, abundant all the year round in S. India.

(1026). The Common Indian Bee-eater.—(*Merops viridis.*)

I dwelt at some length with the migration of this species in Vol. XVII. (p. 520) of this Journal, but as I have gained additional knowledge since then, I will, for the sake of completeness, reproduce much of what I have said there. Blanford says (p. 111, Birds., Ind., Vol. III): "Common and resident throughout India, Ceylon and Burmah. Wanting in the Himalayas, where this species rarely occurs, even in the lower ranges, though there are specimens from Kashmir and Murree in the Hume collection. Absent also as a rule on the higher hills of the Peninsula, and in some of the denser and damper forests. In Ceylon *M. viridis* is found only in the drier parts of the low country. In Tenasserim it has not been observed south of Mergui, and it does not occur in the Malay Peninsula, nor in the Andamans or Nicobars, though it is found in Siam and Cochin China. West of India it extends through Baluchistan and Southern Persia to North-Eastern Africa a resident in general, but locally migratory in some places: thus it is said to leave the island of Bombay from April to September."

The following note recorded by Ward on page 725 of Vol. XVII of this Journal probably disposes of the statement that this species occurs in Kashmir:—

"The name Kashmir is often applied to the whole of the Maharaja's dominions, hence the specimens in the Hume collection may have come from the Jammu province. I have not seen this Bee-eater in Kashmir."

As regards the statement that this bird is as a rule absent from the higher hills of the Peninsula, Davison remarks:—"The bird is very common at Kulhutty on the Nilgiris, about 5,500 feet above the sea; in fact, I have taken the eggs from the roadside just above the dâk bungalow at the above mentioned place, and I have shot the bird in the Neddivuttum Cinchona Plantations, about 6,000 feet above the

It is found in the Khasia hills, although Stuart Baker does not say to what height it extends. He writes: "Common near Sylhet. I have never found this bird breeding in company as it does in other parts of India." As regards the western limit of its distribution, Butler writes:—(Ibis, eighth series, Vol. V., p. 351). "Very common all over the northern parts of the Soudan. It becomes rarer on the White Nile, but I have seen it at intervals as far along as the Bahr-el-Ghazal, and up that river to Meshra-el-Rek." Loat does not mention it among the birds seen by him in the Natron valley about 70 miles W. N. W. of Cairo and 60 miles south of Alexandria. As regards its intermediate distribution, Fulton does not mention it in his "List of the Birds of Chitral," nor does it find place in the List of Birds seen in Seistan by members of the Mission. Marshall does not mention the species in his notes on Birds near Quetta, but Nurse states (B. N. H. S. Journal, Vol. XV., p. 531) that he saw on December 16, 1903, a specimen sitting on a poplar tree. "I was quite close to it at the time", he writes "and am certain of the identification. I had not previously seen a specimen of this species in Baluchistan, though Blanford says that it extends through Baluchistan to Persia. It is certainly not common at Quetta."

Hume states that the species breeds pretty well all over India and Burma, though less commonly in damp, low-lying localities, such as Orissa and Eastern Bengal. Legge says in his "Birds of Ceylon:" "This Bee-eater breeds in the sand hills at Hambantota and other similar localities in Ceylon. I found the young fledged on the south-east coast in June, but did not succeed in finding any nests."

Ferguson states that it is one of the commonest and most numerous birds in the low country of Travancore.

Bingham says: "Except in heavy forest land this little bird is as common in Tenasserim almost as in the United Provinces. It crosses the Dawna range into the Thourgyeen valley, and is found in suitable spots all along the river. It is a permanent resident and breeds there."

Regarding its "local migrations" E. H. Aitken writes:—"In Bombay it is to be seen everywhere from the end of the rains till the beginning of the hot season, but disappears in the interval. Yet it is not ranked as a migratory bird and is so in the usual sense. It only leaves us during the breeding season because it cannot find comfortable family quarters in our island."

B. Aitken remarks: "I have no notes of the nidification of this species, but I have been much struck with the way they totally disappear during the hot season in common with the king-crow and some shrikes. In Poona, weeks after the last of them has been seen in Cantonments, an occasional pair may be met with in some sheltered spot a few miles out. But with regard to the Island of Bombay I have no doubt that the common bee-eater migrates as verily as the common swallow or the grey wagtail. I have been 12 years in Bombay, and never saw so much as a feather of them from April to September. In my notes, I have the 6th October 1865 and the 9th October 1866 recorded as the days of the first appearance of the bee-eater in Bombay in those years. The date of their disappearance in 1867 was the 14th March." According to Col. Cunningham these birds are only temporary residents in Calcutta. They winter there leaving with wonderful regularity at the beginning of the hot weather. Regarding their arrival in Calcutta he writes: "From a record of the dates of its occurrence during a period of 8 years it appears that it took place five times in the second week, once on the fourth day, once on the 7th day, and once in the 3rd week in October, and from a much more extended series of observations the 13th of the month comes out as the normal date. These dates are to be taken as referring to the arrival of the birds to propose to spend a winter in the place; for in almost every year small parties may be seen and heard passing high over head for some days before any come to settle down."

A correspondent, whose letter I have unfortunately mislaid, informs me that it is his belief that this species completely leaves Hyderabad, Deccan, in the hot weather.

As regards Lahore there is not the least doubt that the bee-eater is merely a summer visitant,—it comes in enormous numbers to breed. In a previous number of this Journal I wrote: "I arrived in Lahore on October 19th, 1905, and from that day until March 8th, 1906, I did not set eyes on a bee-eater." They begin to leave Lahore in the first week of October and there is scarcely one to be seen by the 12th of that month.

Writing from Bannu, Magrath says: "*Merops viridis* is a common summer visitor breeding in all the banks about."

In conclusion I should say that during the eighteen months I was in Madras I never discovered any bee-eaters' nests, and suggested that possibly the species left Madras to breed.

These are the facts. How are they to be explained? Why do bee-eaters visit Lahore and Bannu only in the winter? If it is the cold that drives them south in the autumn, how are we to account for the presence of a stray bee-eater at Quetta in December? Further, these birds leave Lahore early in October when the days are still uncomfortably hot, and the nights quite warm.

(1027). The Blue-tailed Bee-eater.—(*Merops philippinus.*)

Blanford says that this bird is distributed "throughout the greater part of the oriental region . . . generally, but somewhat locally distributed over India, Ceylon and Burma, extending west to Sind, but not found in the Himalayas. . . A resident species, partially migratory in many places and in Ceylon merely a winter visitant."

Hume records the finding of its nest in the following places:—Hoshungabad, Lahore, Raipur, Baraich, Allahabad, Agra, Pegu, and Kaukarit in Tenasserim. Thomson says that this species breeds in the Himalayas in the hot valleys of Kumaun far in the interior.

Macdonald writing of Myingyan, says that the bird seems to be "rare in the district except during the breeding season, which is a month later than that of *M. viridis.* It is not even then common. Five eggs were taken from one nest in the river bank south of Myingyan town on the 5th of May."

Baker states that it is fairly numerous round the swamps of Singapore, but does not mention finding its eggs. The bird does not appear to occur in Hongkong. It is only an occasional straggler to the island of Bombay. Ferguson states that it is "a rare bird in Travancore; the Museum contains only one specimen shot near Trivandrum in August 1893." It does not find place in the list of birds of the following places which have appeared in this Journal:—Chitral, Kashmir, Quetta, Seistan.

As regards its migration: there is no doubt that it is a summer visitant to Lahore, where it breeds. Inglis, writing of the Madhubani Sub-Division of the Darbhanga District, says:—"I have found this species scarce in the sub-division though common near Baghownie from the middle of March throughout the rains. Mr. Scroope, however, has observed it in many places during the rains. I have noticed them up to October and they do not remain here after then. I found them breeding in numbers not far from Hatauri during April and May in the banks of the Keray river."

Writing of Calcutta, Col. Cunningham says:—" During the rainy season the common bee-eaters are replaced by their larger relatives, *Merops philippinus*. They make their appearance in great flocks." In my list of the birds of Madras I recorded of this species: " Not very abundant within Municipal limits, but one sees many of them when out snipe shooting." Now snipes are found only in the cold weather, so that it is quite possible that these bee-eaters migrated from Madras at the beginning of the hot weather without my noticing the fact. This is a question which some naturalist now in Madras might easily settle. We must remember that this species is, as a rule, nowhere very abundant, hence is not so likely to be missed, if it migrates, as a more abundant species would be. Osmaston says that the bird is a winter migrant to Narcondam. He states that it is not common in the Andamans. " I saw" he writes, " a few individuals near Port Blair in March and also in Narcondam in October. They were probably only in migration at the time and do not seem to stop in the Andamans."

Bingham writes from Tenasserim: " this bird being partially migratory is often overlooked; but it is common nearly all the year round at Kaukarit on the Houndraw river."

Major Magrath in a letter to me from Bannu, dated 27th October 1907, says: " I shot examples of both *Merops persicus* and *M. philippinus*. *M. persicus* breeds in great numbers somewhere near by Bannu Cantonments, but I have not discovered where. *M. philippinus* appeared to be passing through from breeding grounds somewhere to the north or west."

The evidence then seems to point out to a migration nearly due north in spring and south in autumn. The most southerly place in India proper in which I can find a record of the nesting of this species is Raipur—about Lat. 21°. But in Tenasserim, according to Bingham, it nests as far south as Kaukarit, the latitude of which appears to be about 11°. Those who are stationed in India south of latitude 20° might profitably watch for any signs of migration of this species.

(1120). The Indian Koel.—(*Eudynamis honorata.*)

Blanford writes of this species:—"Distribution. Throughout India, Ceylon and Burmah except on the Himalayas about the tropical zone. This bird is rare in Sind and the Punjab and is not known further west. To the eastward its range extends to China and to the south-east throughout the Malay Archipelago to Flores. Hume found it in the Laccadive Islands, and it is common on the Andamans and Nicobars. The race from the countries east of the Bay of Bengal has been distinguished as *E. malayana* on account of its rather large size and little stronger bill; the female, too, is said to be more rufous, but the differences are neither well marked nor constant." Its eggs have been found (rarely) in Ceylon, and in Madras, although seeing how very abundant it is in the capital of the Southern Presidency, I observed remarkably few young koels there. Ferguson states that although rare it is a permanent resident in Travancore.

Barnes (Birds of Bombay Presidency, p. 131) writes:—"The Indian Koel is very common throughout the district, excepting Sind, where it appears to be somewhat rare. Some of them at least are permanent residents, but during the breeding season they are everywhere more common."

Jesse writing of the Lucknow district says:—"According to Reid the koel is a permanent resident, but I fancy it migrates, at any rate to a very great extent, in the cold weather."

There is not the least doubt that it is merely a summer migrant to Lahore. Not a koel is to be seen in that place between the end of October and the middle of March, but throughout the hot weather it is exceedingly abundant. The young birds appear to remain on for some time after the old birds. Inglis states that it is "abundant in Darbhanga," but does not say whether or no it is more numerous in the hot weather than in the cold. Osmaston states that the koel although abundant in the Andamans and Naroondam (a small solitary island situated in the Andaman sea in lat. 13° 26') is only a cold-weather visitor. It arrives in September and October and leaves in April. Macdonald says that koels are "common during the cold weather and noisy during the breeding season, March and April" in the Myingyan district of Burma, about the latitude of Calcutta.

Ward names this species as one of the birds of Kashmir and Jammu, but does not say whether or no it is a migrant.

Major Baker writing of Singapore says that the only specimen of the koel he saw there was shot by a friend in his garden and given to him.

Kershaw writes that the koel is a very common resident at Hongkong, where it lays in May.

As I am not able to gain access to a good library, I have not been able to collect any further data regarding the distribution and movements of this interesting species. Were it not for Kershaw's statement in *The Ibis* that the koel is a common permanent resident of Hongkong I should have been inclined to think that all koels undergo easterly-westerly migration every year, moving west in spring and east in autumn. That such migration does occur, is proved by the absence of koels at Lahore, their scarcity in Lucknow during winter, and their absence from the Andamans in summer. On the contrary, the fact that koels are seen all the year round in Hongkong and its vicinity seems to show that some individuals are non-migratory. Why this should be I am at a loss to explain.

(1311). The Red Turtle-Dove—(*Œnopopelia tranquebarica*).

Blanford gives us the distribution of this species:—"Throughout India, by no means scarce in the Punjab, Sind and Rajputana, though not known farther west. This bird was obtained at Gilgit by Biddulph, and in Ceylon, where it appears to be very rare, by Layard. It ranges throughout Burma to the Andamans and through Cochin China and China to the Philippines." Hume says that it breeds in all parts of India, but is very capriciously distributed, and expressed himself unable to say what kind of country it prefers and why it is common in one district and rarer in the neighbouring one in which all physical conditions appear identical. Jesse states that it is a common and permanent resident in the Lucknow district. Ferguson does not mention the species in his list of the birds of Travancore.

Ward states that it is rarely to be found in Kashmir. Osmaston writes that it is "exceedingly common in and round Port Blair (Andamans) breeding in April and May. This dove was rare in Hume's (1873), but has multiplied apparently with the increase in area under cultivation."

Macdonald writing of Myingyan, says:—"This at certain seasons is also a common bird. Sometimes seen in large flocks but I have never found the nest, nor have I been able to procure the eggs from the natives." This looks rather as though the bird was not a permanent resident in the Myingyan district and that it did not breed there.

There is no doubt that this species is merely a summer visitor to Lahore: it arrives in April or May, and begins to lay in June. The nest is usually placed high up in a tree. By August most, if not all, the members of this species seems to have disappeared from Lahore. Butler says of this dove :—"Arrived in large numbers in neighbourhood of Hyderabad, Sind, about the end of April, and in the month of June I noticed nests innumerable on the babul trees below the camp." Some, therefore, of the individuals of this species appear to undertake a double annual migration in a westerly-easterly direction, going west to breed.

According to Hume this species has two broods in the year, one in January and the other in May or June. If that be so the birds which breed in Lahore in June must breed in some other locality in January. This, I submit, does not appear probable. Barnes says that he found nests of this species in Rajputana only in November. Butler records nests in March, April, May, June, July, August and September.

Hodgson states that in Nepal it lays from January to May, so that its nests appear to have been taken in every month of the year. It is difficult to reconcile this with the migratory habit.

(1568). The Night Heron. (*Nycticorax griseus*)

This bird is usually accounted a non-migratory species. However, I have neither seen nor heard the bird during two cold weathers I have spent in Lahore. In each year some eighty or one hundred of hem arrive in spring and nest in the trees that grow on the island n the ornamental water of the Lahore Zoological Gardens. I should have been inclined to regard this as a case of concentration for breeding purposes, rather than of true migration, had not Major Magrath written to me "the night heron passes through Bannu on migration north, but I do not think any remain to breed here. The pond heron is a common breeding species in hot weather." It would therefore seem that some, at any rate, of the night herons of Northern India are migratory. The above eight *birds*, are, I believe, the only summer migrants to Lahore. The *Pied* crested Cuckoo (*Coccystes jacobinus*) appears n Lahore foı a ew days in

July or August, but I have not heard of its eggs being found in or about Lahore.

One species, namely *Molpastes leucotis*, the White-eared Bulbul, is, so far as Lahore is concerned, a migrant. It appears in November and leaves us in March. Hume writes of this species :—"In the cold weather it may be met with at Agra, Cawnpore, and even Jhansi, Saugor and Hoshungabad : but during the summer months I know only of its occurring in Cutch, Kathiawar, Sind, Rajputana and the Punjab. In all these localities it breeds, laying for the most part in July and August in the Punjab, but somewhat earlier in Sind. I have even in Rajputana seen eggs towards the end of May, but this is the exception. Theobald states that this species breeds in the neighbourhood of Pind Dadan Khan and Katas in the Salt Range." I am positive that no white-eared bulbul remains with us in Lahore for the hot weather. Magrath says that it occurs in Kohat in the summer, but is replaced by *M. leucogenys* in winter. It therefore appears that this species undertakes a short double migration in a easterly-westerly direction every year.

Molpastes intermedius—the Punjab Red-vented Bulbul, on the other hand does not appear to migrate ; it is common all the year round in Lahore and I must have come upon scores of nests. It is difficult to explain why one of these two species migrates while the other does not. So far as I am aware their feeding habits are similar. It is equally difficult to account for the migration of most of the other species on which I have dwelt. In most cases we do not know sufficient of the nature and extent of these migrations to formulate any theory. The subject is one of some scientific interest and I hope this note will have the effect of stimulating others to take up the matter of these curious local migrations.

In conclusion, I might say that the King-crow (*Dicrurus ater*) is much more common in Lahore in summer than in winter. It comes in great numbers to breed, but only a few individuals remain in Lahore throughout the winter. It is quite possible that this species is merely a summer visitor to some places in the Frontier Province. I understand that the King-crows all leave Poona during the hot weather.

A VISIT TO BARREN ISLAND IN THE ANDAMANS.

BY

B. B. OSMASTON, I.F.S.

On the 9th April 1907, I had the good fortune to visit Barren Island in the Port Blair station steamer, the R I.M.S. "Mayo."

We arrived off the island at daybreak, and anchored to the South, the only practical anchorage owing to deep soundings and steepness cf the foreshore.

The island is situated in North latitude 12° 16′, 83 miles North-East of Port Blair. It is an extinct volcano, the summit of which rises 1,158 feet above the sea. It can be seen on exceptionally clear days from the top of Mount Harriet (close to Port Blair), which is 1,193 feet in altitude.

The island is roughly circular and about 6 miles in circumference. It consists of a central cone, almost devoid of vegetation, surrounded by a circular crater or amphitheatre, almost as high as the central cone, continuous except at one point, where it is broken down to the level of the sea; and it is through this gap that the drainage of the island finds its way into the sea. The crater is densely clothed with forest on its outer slopes facing the sea and also, to a certain extent, on the inside, *i e.*, facing the central cone, especially where it has a northern aspect.

There is absolutely no fresh water on the island, with the exception of a hot spring (temperature 98° fahr.), which is found at the abovementioned gap, but below sea level except at low tide.

The central cone was active within recent historical times. Captain Blair in 1795 reported volumes of smoke and showers of red-hot stones, and subsequent visitors have noted less eruptive activity.

It appears, in fact, to have been steadily settling down, and now the only signs of activity consist in the escape of intensely heated vapour from two small vent holes near the summit and one near a lump on the flank, around which sulphur is deposited.

The fauna of the island is naturally poor, the only mammals being the domestic goat introduced in 1891 and a rat (*Mus atratus*, Kloss). The former seem to thrive well in spite of the scarcity of water, and they may be seen in small parties all over the island.

They are fairly tame owing, no doubt, to the fact that they have no enemies and that the island is very rarely visited by men. They have also, for the same reason, improved very little in activity. They can be run down and captured by an ordinary active man, and our party caught several in this way, including a fine full-sized he-goat.

They are of various colours—grey, brown and black or parti-coloured. Had they predacious enemies to contend with, they would, no doubt, even in the short period of 16 years they have been on the island, have acquired a more uniform colouration; but, under existing circumstances, a sober protectively coloured animal has no advantages over one more conspicuous.

The scarcity of fresh water on the island has also given rise to a curious habit. The goats quench their thirst with salt water! It was originally supposed that they drank at the hot spring; but this, I think, is improbable from the fact that the time of low water when the spring is accessible, varies from day to day, and a thirsty goat coming for a drink at or near high tide would be doomed to disappointment, and would not have sense to sit down and wait a few hours for the tide to fall. As a matter of fact, the he-goat which I brought to Port Blair at first actually refused fresh water, and walked down deliberately to the seashore for a drink.

The following birds were observed on the island. The numbers refer to the "Fauna of British India", Birds:—

(226). *Zosterops palpebrosa.* (The Indian White Eye).—Very common and, no doubt, resident.

(557). *Muscicapa grisola.* (The Spotted Flycatcher).—Noticed a few birds of this species inside the crater. This is also a resident species.

(847). *Anthus cervinus.* (The Red-throated Pipit).—Shot one out of three seen on a grassy patch below the central cone. These birds are, of course, migratory.

(1120). *Eudynamis honorata.* (The Common Koel).—A cold-weather visitor as in the Andamans.

(1137). *Palæornis magnirostris.* (The Large Andaman Paroquet).—This bird is numerous, and, doubtless, breeds on the island.

(1224). *Haliaëtus leucogaster.* (The White-bellied Seaeagle).—A few of these eagles were seen soaring above the island.

(1289). *Myristicivora bicolor.* (The Pied Imperial Pigeon).

(1290). *Calœnas nicobarica.* (The Nicobar Hackled Pigeon).

Both of these handsome pigeons were fairly frequent in the forest on the outer slopes of the crater. They are, doubtless, resident, and breed on the island which is suitable in every respect as a breeding ground.

(1291). *Chalcophaps indica.* (The Bronze-winged Dove).—Not uncommon inside the crater.

(1401). *Amaurornis phœnicurus.* (The White-breasted Water Hen).—This species appeared to be fairly common, which is very remarkable, considering the absence of fresh water. They keep to the dense jungle.

(1598). *Nettium albigulare.* (The Oceanic Teal).—We saw a pair near the hot spring. I think it is improbable that this species should remain at Barren Island to breed.

We noticed no reptiles on the island, but magnificent fishing is to be had in the moderate depths off the shore.

[*] PALINURUS OR "THE SPINY LOBSTER" OF BOMBAY.[†]

BY

ARTHUR POWELL.

(With Illustrations.)

This animal is to be found in abundance all the year round on the coasts of Bombay.

Prices vary with the supply and demand as well as with size, but good specimens can be obtained during suitable states of the tide at prices varying from four annas to less than a pice.

Though locally called Lobsters, they do not belong to the same genera or even to the same family as the English Homarus or Norwegian Nephrops, and the inexperienced student attempting to study the anatomy of the Cray-fish or Lobster will soon become woefully muddled when he attempts to reconcile the accounts of the Lobster in English text books with his personal observation of Palinurus.

It is with the hope of assisting the Indian student to a practical knowledge of the anatomy of this common animal that the following pages are written.

The writer earnestly entreats the student never to open these pages without having in front of him one or more living or dead specimens of the animal. Otherwise by mere reading he will gain little genuine knowledge and that only with an infinity of pains, whereas with the animal before him he can verify with his own eyes and hands

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[*] I have called this animal Palinurus though by many the oriental species are considered worthy of generic rank and called *Panulirus.* There has been some discussion as to who had the honor of inventing the latter epithet. Palinurus was the worthy pilot of Æneas, ship. He fell overboard and was drowned near a cape, to which and the "Spiny Lobster" of England, the "Langouste" of France, he has since stood god-father. "Panuliros," Greek for ' wholly lewd,'' "without a trace of shame," is a foul libel I would hesitate, without the most damning evidence, to apply to any gentleman. much less to the hero of my sketch.

My own impression is that the name was accidentally invented by a Babu from "Nucklow" who invariably transposes his "ls" and "ns" The first specimens received in Europe were packed and labelled by a Museum Babu in Calcutta.

Perchance he had supped not wisely the previous night on Lobster salad and felt the epithet, *Panuliros,* "bilkul luchcha," all too feeble a summary of his more vigorous Bengal, vituperation.

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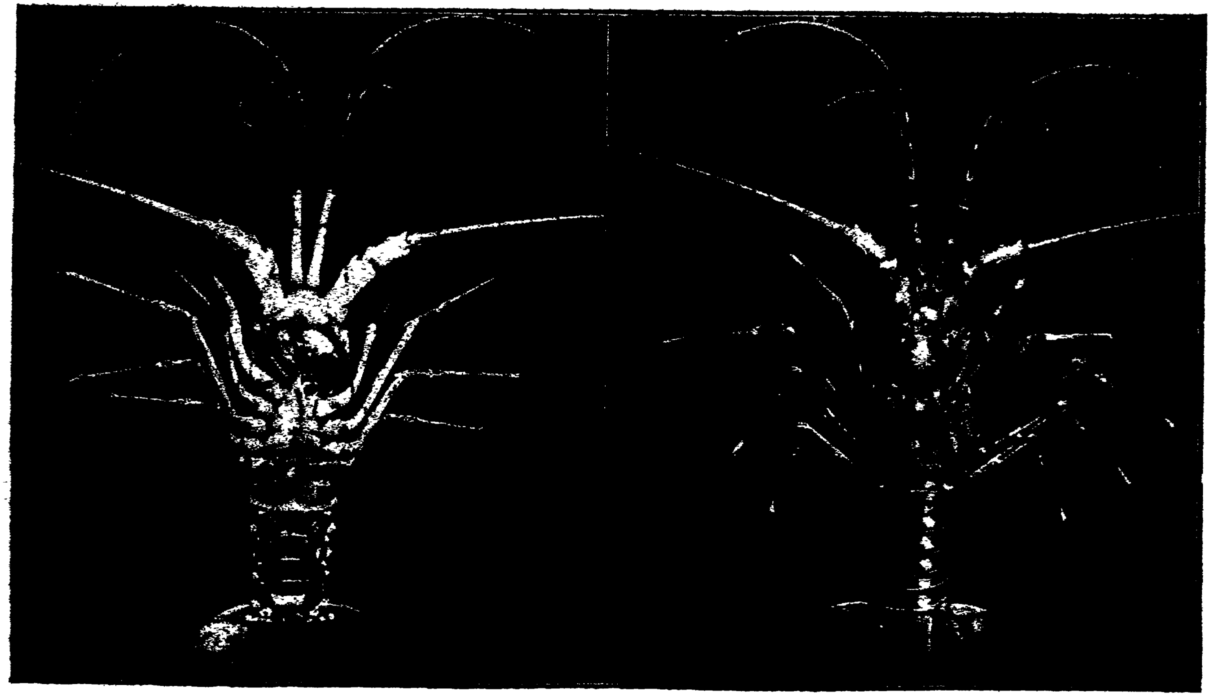


(*Ventral view.*) (*Dorsal view.*)

PALINURUS OR "SPINY LOBSTER". (½ Nat. size.)

The foot-jaws of the animal's left side have been removed to show the jaw apparatus and a common pin has been inserted in the opening of the left "green gland". A short black rod in the left sperm aperture, a large black-headed pin placed under the second maxilla to show it with its scaphognathite.

and form a clear mental picture o otherwise dull and uninteresting facts.

I am well aware that the object of most of our University students is simply to pass their examination and that as speedily as possible, but they as well as the honoured few who love science for its own sake, will find they can master well the syllabus of Biology by practical study and dissection in at least one-fourth the time mere reading may enable them to scrape through by the charity of an indulgent examiner.

Therefore, I say, first catch your Palinurus. This you can do with impunity as he possesses none of the powerful *forceps* with which his European cousin, the Lobster, or some of the Indian Prawns can pinch and wound the unwary investigator.

If alive he will probably make a croaking noise as you lift him. This sound as you can verify yourself is caused by rubbing the first movable joint of the large feelers against the neighbouring fixed part.

He may perhaps startle you by forcibly flapping his tail against the under surface of his thorax. When in his native haunt, the sea, he is able to suddenly dart backwards by similar powerful strokes of the tail, but the usual mode of progression is swimming by gentle strokes of the flat tail fin, while the swimming feet all row together with an even swing like the oars of a boat. When on the bottom of the sea he half swims, half walks, on the long thoracic legs.

Note the movement of the jaw apparatus. Each jaw moves horizontally to and from the middle line of the body; not up and down as do the jaws of a dog or man.

Next look under the anterior edge of the large shield-like covering of the cephalo-thorax. You will notice a small scoop or paddle-shaped appendage moving rapidly to and fro two or three times a second. This is the paddle or *scaphognathite* (Gr. *scaphe*, boat, *gnathos*, jaw), by means of which the water entering the gill-chamber from behind is scooped out in front so that a continuous current keeps bathing the gills to enable them to absorb the oxygen dissolved in the water and get rid of the carbonic acid.

The course of the current is easily demonstrated by returning the animal to the water after it has been in the air for some time. On re-immersion, bubbles of air are for some time seen to come out from under the anterior edge of the gill-cover. Should this not satisfy you, if you put some finely powdered carmine or indigo in the water just behind the gills, you will soon see the coloured current pouring out in front of the scaphognathite.

The whole body of Palinurus is covered by an integument composed of a number of epithelial cells which correspond to the epidermis of man and higher animals. These cells secrete a substance which forms a continuous layer all over the surface of the body and limbs and at the mouth and anus is continuous with the lining of the gullet. stomach and most of the intestine. This layer is known as the cuticle and throughout contains a substance known as *chitin* (Gr. *chiton*, a coat). Here and there it is impregnated with salts of lime to form the rigid armour-like portions of the exoskeleton. Any hardened portion is known as a *sclerite* (Gr. *skleros*, hard). By pouring a little strong acid on the hardened skeleton the lime will be dissolved with the ebullition of gas bubbles. You must clearly understand that the cuticle of the invertebrates is not homologous with your own cuticle or that of other vertebrates, which is composed of a number of flattened epithelial cells, that of the invertebrates being non-cellular, *i.e.*, only a secretion, and shows no nuclei or cellular structure.

Between each somite of the cephalo-thorax behind the mouth, there is an infolding of the cuticle, each such infolding being called an *apodeme* (Gr. *apodaio*, I partition), to form an internal skeleton, or *endophragmal* system, on the floor of the cavity. These sclerites form in the middle line a tunnel or series of archways over the sternal sinus, the nerve cord and sternal artery. Laterally they resemble the bulkheads of a ship and give attachment to the muscles.

The whole of this cuticular skeleton, including the apodemes and the lining of the fore and hind guts, is shed or moulted periodically.

The body is divided into two easily recognised regions, a posterior *abdomen* made up of six *somites* (Gr. *soma*, body), freely movable on one another in the vertical plane but having no lateral movement. These somites are all clearly homologous with one another and except the first each bears a pair of lateral appendages. Behind all is a seventh segment, the "tail" or *telson*, which bears no appendages and is not a true somite. Anteriorly is the *cephalo-thorax* (Gr. *kephale*, the head), covered dorsally and on the sides by a large rigid shield or *carapace*, in which there is little indication of segmentation.

Ventrally however the presence of a number of transverse bars and of thirteen pairs of appendages will lead you to conclude that the head is composed of five, and the thorax of eight somites.

The structure of a somite may best be studied by taking as a type one from the abdomen, say the third, of which, Fig. 1 represents a transverse section, nearly semicircular in outline. The exoskeleton of the segment surrounds it as a ring being hardened by calcification where rigidity or protection is required, and remaining soft where flexibility is necessary. Dorsally the hard exoskeleton forms a broad arch known as the *tergum* (Latin, the back) ; the lateral portions projecting downwards, and terminating in recurved spines are called the *pleura* (Gr. *pleuron*, side, rib). Ventrally the ring is completed by a narrow straighter bar to the outer ends of which the appendages are articulated. That portion of the bar between the swimming feet is called the *sternum* (Latin, breastbone). The very small portion of the bar external to the limb and internal to the pleuron is the *epimeron* (Gr. *epi*, upon or above ; *meron*, the thigh).

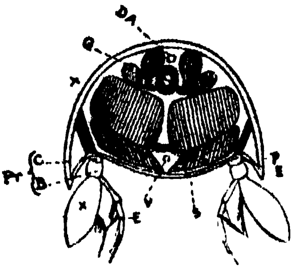


Fig 1

Fig. 1.—TRANSVERSE SECTION OF 3RD. ABDOMINAL SOMITE.

C = Coxopodite } *Pr.* = Protopodite.
B = Basipodite }
DA = Dorsal Artery.
E = Epimeron.
G = Hind-gut.
P = Pleuron.
N = Endopodite.
S = Sternum.
T = Tergum.
V = Sternal artery.
The black dot above it is the nerve ganglion.
The clear space around is the ventral sinus.
X = Exopodite
The shaded portions are muscles.

Between these rings of sclerites the integument is soft and flexible to allow of free movement.

The terga of the successive somites overlap one another from before backwards like the tiles of a house ; their movement is restricted to the vertical plane by very neat hinge-joints formed by a short peg on the posterior margin close to the pleuron, which fits into a corresponding socket on the anterior margin of the next tergum.

The appendages are attached by soft cuticle or arthrodial membranes to the margins of a circular opening in the ventral sclerite, between the epimeron and sternum as already described.

The appendages differ markedly in the sexes. In the female we find a basal stem or *protopodite* (Gr. *protos*, first, podite from *pous*, *podos*, a leg or foot, signifying a leg segment), consisting of a very short proximal *coxopodite* (*coxa*, the hip) and a larger distal piece the *basipodite* (*basis*, the base). To the distal end of this are articulated two flat leaf-like structures, an outer *exopodite* (Gr. *exo*, outer) and an inner *endopodite* (Gr. *endo*, inner).

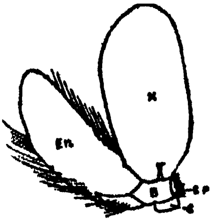


Fig.2

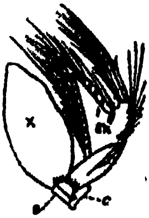


Fig 3

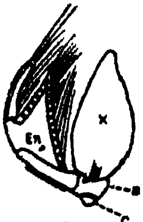


Fig.4

Fig. 2.—SWIMMING FOOT OF 2ND ABDOMINAL SOMITE OF FEMALE.
Fig. 3 — „ „ OF 3RD „ „ „
Fig 4.— „ „ OF 4TH „ „ „
All are of the right side; Figs. 2 and 3 are seen from front, Fig. 4 from behind, to show the Epipodite-like sclerite.

The exopodite is shaped somewhat like a rabbit's ear. The greater part is membranous in character, being composed of a double layer of cuticle covering a little connective and muscle tissue; only the basal portion is calcified.

The inner margin of the endopodite is a calcified rod of three pieces united by membranous joints. In the appendage of the second abdominal somite the whole of the external portion forms a thin membranous leaf, very like the exopodite in appearance but bearing on its margins a fringe of hairs.

The protopodites and exopodites of the next three segments, namely the third, fourth and fifth, resemble those of the second, but become progressively smaller. The leaf of the endopodite is however curiously divided. There is a triangular flap attached along the two proximal pieces; its free margin strengthened by numerous small white sclerites. The distal piece forms a calcified margin to a narrow plate. The margins of the whole endopodite bear numerous long silky hairs to which the eggs become attached when laid.

To the outer side of the protopodite of these swimming feet is attached a small white sclerite with a fringe of short hairs. It may be the homologue of a process known as the *epipodite* found on the thoracic legs, but it differs in being attached by membrane to the basipodite as well as to the coxopodite. Gills are attached to the abdominal appendages of certain Copepods, another order of the Crustaceæ.

In the male all the above appendages are much smaller and have only one leaf, the exopodite, as the endopodite is quite suppressed.

In both sexes the first abdominal segment is devoid of appendages. Its tergum has a large buttress on each side just above the hinge which prevents over-extension by coming in contact with the posterior margin of the carapace.

The lateral appendages of the sixth abdominal somite are very large and with the telson form the powerful five-leaved tail fin.

The protopodite consists of a single piece. The endopodite and exopodite form two large oval plates, each with a proximal stout calcified, and a larger distal membranous portion.

The telson may be regarded as a median appendage of the sixth somite. Ventrally it is for the most part uncalcified, and in its anterior portion is perforated by a longitudinal opening, the anus.

Two small oblique linear sclerites are seen on each side but somewhat in front of the anus. Dorsally the proximal portion is calcified but the greater part is membranous. The proximal part of this membranous surface as well as of the rest of the " tail-fin " is studded with minute spines.

CEPHALO-THORAX.

The dorsum and sides of the cephalo-thorax are covered by a large unjointed shield, the carapace, which dorsally terminates in front behind the eye-stalks by a broad crescentic notch limited at each end by a stout spine which projects forward above and internal to the eye.

In front of the eyes is a broad plate firmly attached to and looking like an extension of the carapace. This is not its true homology however, and we will later on see that it is part of the united basal joints of the antennæ. The dorsal part of the carapace bears a number of sharp spines which project forward and are most of them arranged in eight longitudinal rows. These sharp spines are some compensation for the absence of the defensive pincers which Lobsters and Prawns possess. They render Palinurus an ugly customer to attack and an uncomfortable mouthful to swallow.

About the middle of the dorsal surface we find a transverse *cervical groove* which runs downwards and forwards on each side of the carapace.

This groove (Latin *cervix*, neck) marks the junction of the head with the thorax and is the only evidence of segmentation in the carapace.

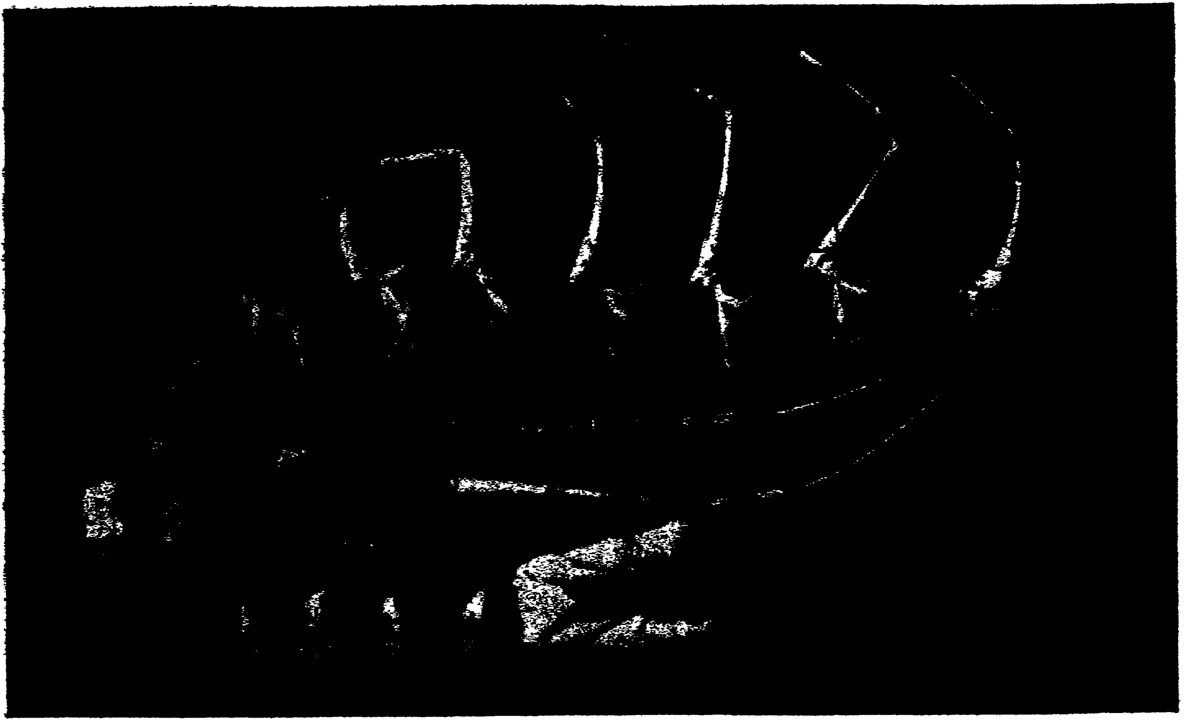
Behind the transverse portion of the groove is a quadrilateral space known as the *cardiac area* because the heart lies below it. The grooves that mark its lateral limits are continuous in front with the cervical and are also continued backward to form two longitudinal grooves, known as the *brancho-cardiac* grooves, because all the descending portion of the carapace below these grooves forms a cover for the *branchiæ* or gills and hence is known as the gill-cover or in Greek, *branchiostegite*.

This cover is homologous with the pleura of the abdominal somites.

The sterna of the cephalo-thorax are much more obvious in Palinurus than in the Cray-fish, Lobster or Prawn. Between the five pair of walking legs is seen a large triangular or shield-shaped plastron, with its apex pointing forward. A number of transverse sutures show it is formed of the five sterna united together. On separating the foot jaws their three sterna are seen as a rod continuous with the apex of the plastron, a stout tubercle marking the points of union between its segments.

The epimera of the thoracic segments form the inner wall of the gill chamber as a continuous delicate layer which at the dorsal limit of the chamber is continuous with the inner lining of the gill-cover.

The wall formed by the epimera is thin and but slightly calcified except just above the articulation of the appendages. Above the last walking leg it forms a specially strong plate bearing a stout process in shape and function resembling a shirt stud. The posterior margin of the carapace is tucked or reflected inwards and on each side of this reflection is an oval buttonhole into which the top of the epimeral stud buttons.



APPENDAGES OF MALE.

Fig. M = Metastoma, which has not been separated from IV, the 1st pair of maxillæ.

Were it not for this buttoning arrangement the posterior portion of the carapace might be tilted upwards and the gills exposed, as the articulating membrane between it and the first abdominal tergum is loose to allow of free flexion and extension.

We have seen that the abdominal appendages are paddle-shaped in accord with their function as swimming organs. The cephalo-thoracic appendages are formed on the same plan but with considerable modification in structure to adapt them for different functions.

Without counting the eye-stalks, they are from before backwards.

Appendages of the head.	I.	A pair of antennules	Main function organs of sense or "feelers".
	II.	A pair of antennæ	
	III.	A pair of stout mandibles	Jaws.
	IV.	A pair of first maxillæ	
	V.	A pair of second maxillæ	
Appendages of the thorax.	VI.	A pair of first maxillipeds	Foot-jaws.
	VII.	A pair of second maxillipeds	
	VIII.	A pair of third maxillipeds	
	IX.	A pair of first walking legs	
	X.	A pair of second do.	
	XI.	A pair of third do.	
	XII.	A pair of fourth do.	
	XIII.	A pair of fifth do.	

In Plate B the appendages are indicated by these numerals.

Remove the gill-cover of one side with stout scissors cutting from behind forwards a little external to the branchio-cardiac groove. Keep the scissors close to the gill-cover or you may cut the gills. Make a second vertical cut at right angles to the first, a little behind the cervical groove. Count the gills and note the position in which they are attached. You will find on moving the last walking leg to and fro that none of the gills are disturbed, but on moving any of the other walking legs or the second or third maxilliped, a gill and also a membranous flap is moved to and fro with the limb. These gills as they are attached to the legs are known as *foot-gills* or *podobranchiæ* (Greek *pous*, *podos*, a foot ; *branchia*, a gill).

Of the other gills you will find four are attached to the epimeron or the inner wall of the chamber. As they are opposite the last four walking legs, it is obvious they belong to the last four thoracic segments. They are called the side-gills or *pleurobranchiæ* (Greek *pleuron*, side).

The remaining gills are eleven in number. The most anterior is attached to the membrane which joins the second maxilliped to the thorax. The other ten are attached in pairs to the inter-articular membranes of the last maxilliped and of the first four walking legs. From their attachment they receive the name of "joint-gills" or *arthrobranchiæ* (Greek *arthros*, a joint).

Remove the thoracic limbs one by one beginning with the hindmost. With the point of a knife cut the articular membrane close to the basal piece of the limb so as not to remove the arthrobranch; but be careful to remove the foot gill and leaf-like flap. When the articular membrane has been cut all round, a gentle wrench will disengage the two little pegs and sockets by which the limb is hinged.

Number the limbs with a coloured pencil so that you can recognise to which segment each belongs.

The second maxilliped is perhaps the most complete of the limbs and you had better study it first as a type of the whole series.

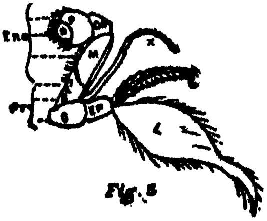


Fig. 8 – SECOND MAXILLIPED.

B Basipodite } *Pt.* = Protopodite.
C Coxopodite }
En Endopodite
I Ischiopodite.
M Meropodite.
Ca Carpopodite.

P = Propodite.
X = Exopodite.
G = Gill.
Ep = Epipodite.
L = Lamella or leaf.
D = Dactylopodite.

Like the swimming limbs, it is made up of a proximal stem, the protopodite, consisting of coxopodite and basipodite to the latter of which are attached two terminal divisions, the endopodite and exopodite. Attached to the outer surface of the coxopodite we find a new structure, a lateral development which runs up into the gill chamber and bears at its extremity a gill in front and a thin membranous lamella behind.

The whole of this lateral structure, including the basal calcified podomere articulating with the coxopodite, the gill and the leaf or lamella is called the *epipodite.* The surface of the lamella and especially its margins bear a number of hairs. It is formed of a double layer of chitinous cuticle. Its function is unknown but it may prevent the filaments of contiguous gills becoming entangled.

The basipodite is movably articulated with the coxopodite, but distally it is firmly united with the proximal joint of the endopodite so that it may easily be mistaken for a portion of the latter limb-segment which is known as the *ischiopodite* (Greek *ischion*, the hip). A well marked notch at the inner margin indicates the point at which the two segments are fused.

That this is the true homology or explanation of the structure will be at once admitted on comparing the corresponding limb of a Cray-fish or Lobster in which there is a distinct movable articulation between the basipodite and ischiopodite, of which we have only a notch left as a vestige in Palinurus.

This ankylosis or immovable union of the basipodite and ischipodite is characteristic of all the thoracic limbs of Palinurus whereas in the Lobster we find the joint ankylosed in the great pair of chelæ or pincers, and in the third maxilliped only; the second maxilliped and all the walking legs have a freely movable joint between the basipodite and ischiopodite. To the latter is movably articulated the *meropodite* (Greek *meron*, a thigh), the longest segment of this limb. Next comes a short triangular piece, the *carpopodite* (Gr. *karpos*, wrist), next a *propodite* (*pro*, in front), a broad flat segment with a concave distal margin to the centre of which is articulated the terminal *dactylopodite* (Gr. *dactylon*, a finger). All these podomeres of the endopodite are more or less flattened to form horizontal plates, the inner margins of all being covered with stiff bristles or *setæ*.

The exopodite is a long many-jointed palp-like flattened filament, of which the proximal piece is as long as all the others—about seven—taken together.

We may regard a typical appendage as made up of a proximal stem or protopodite of two segments, coxopodite and basipodite. The coxopodite bears laterally an epipodite with its gill and lamina. To the distal end of the basipodite an endopodite and exopodite are attached, the latter of a variable number of segments. the endopodite of five, ischiopodite, meropodite, carpopodite, propodite and dactylopodite, enumerating from base to tip.

All the appendages may be regarded as built on the same plan, and all their variations in appearance and function are due to one or more of three factors—

1. Suppression or atrophy of a part or parts.
2. Union or coalescence of parts.
3. Modification of a part or parts.

The third maxilliped much resembles the second, but is considerably larger and stouter. The expodite is however completely suppressed, though in the Lobster and Prawn it is well developed.

The epipodite has both gill and leaf. The basipodite is firmly ankylosed with the ischiopodite as in all the thoracic limbs of Palinurus, the line of union being better marked than in the second maxilliped by a constriction forming a complete ring. The meropodite is in this limb the longest segment. All pieces of the endopodite are somewhat triangular in transverse section, being less flattened than the second maxilliped. The apex of the triangle forms the outer margin of the endopodite, the base being flat and well covered with bristles. The dactylopodite is much longer than that of the second foot-jaw and is covered with hairs.

The maxillipeds and maxillæ are all directed forward in the horizontal plane, so as to overlap one another, below the opening of the mouth.

The first maxilliped is much modified. The two segments of the protopodite have become broad thin plates with an inner thin cutting edge fringed with stiff setæ. The epipodite has become a thin membranous plate with no trace of a gill.

The endopodite is a small oval plate, its inner margin setose. The exopodite is relatively very large. Its proximal joint forms more than half its length; the remaining nine joints are much broader than long and together form an oval plate fringed with setæ, and twisted at the base through an angle of about 150 degrees, so that the anatomical inner surface looks outward.

The walking limbs are much alike. The first is the shortest and stoutest. The coxopodite, short and irregular in shape, bears at its outer dorsal angle an epipodite, the proximal portion of which is calcified and bears a gill and leaf. The basipodite is firmly ankylosed with the ischiopodite, the two together being about as long again as the coxopodite. The meropodite in this limb is the longest segment the carpopodite is short, the propodite long bearing a few setæ on the inner surface of its distal extremity. The dactylopodite forms a sharp claw or talon and is almost covered with setæ.

The second leg is longer and more slender, but otherwise resembles the first.

The third is the longest of the legs. There are fewer hairs on the propodite. On the dactylopodite the hairs form two lateral fringes. In the female the ventral surface of the coxopodite close to the sternal articulation shows a small pin-hole which is the orifice of the oviduct.

The fourth resembles the preceding.

The fifth differs from the other legs in having no epipodite and consequently no gill. In the male the ventral surface of the coxopodite has a large opening for the vas deferens. The propodite is about the same length as the meropodite. The dactylopodite is claw-like.

In the female, the propodite is the longest segment and the inner angle of its distal end is prolonged to form a spine against which the dactylopodite can be opposed so as to form a small pincer or forceps. The dactylopodite is somewhat bifid having a large outer claw and a short inner one which forms the outer blade of the forceps.

This is the only representative in Palinurus of the powerful forceps so characteristic of Cray-fish, Lobsters, Prawns and Crabs, and it is worthy of note that while all these Crustaceans have the anterior walking legs chelate, it is only the posterior limb of the female Palinurus that is chelate, while the male has no trace of forceps.

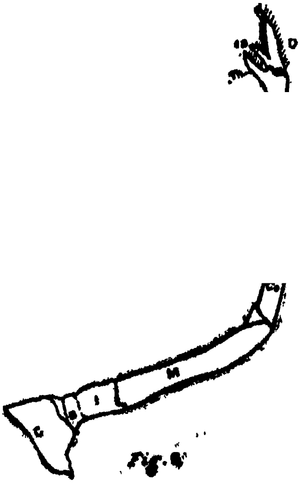


Fig. 6.—LAST WALKING LEG OF FEMALE.
D = Dactylopodite.
ID = Inner opposable process of Dactylopodite.
Thp = Inner distal process or "Thumb" of Propodite.
(Other letters as in Fig. 5.)

THE APPENDAGES OF THE HEAD.

To the parts of the antennæ special names are given, the termination "*podite*," *i.e.*, a "leg piece", being changed to "*cerite*" in Greek, signifying a "horn piece" or feeler piece.

In the case of the jaws the termination "*gnathite*", Greek for "jaw piece", is often used, *e.g.*, protognathite, scaphognathite, etc.

The second maxilla is so overlapped by the first maxilliped as to be almost concealed from view. It presents the appearance of two thin plates, the inner of which is soft and membranous, its inner margin fringed with hairs and divided into three serrations. The proximal of these represents the coxopodite, the second, the basipodite, and the third possibly the endopodite. The outer chitinous flap which lies under the cervical groove is the rapidly moving paddle by means of which water is continually baled out of the gill chamber. It is the epipodite probably united with the exopdite. It has received the name scaphognathite from its boat-shaped outline. The functions of this limb being mainly to assist in respiration, its masticatory portion is uncalcified, feeble and degenerate.

The first maxillæ are more obvious than the second in the living animal, being more exposed and nearer the middle line. Each resembles the Prince of Wales' crest in shape and is firm and well calcified. The middle "plume," the largest, is the basipodite, the inner, the coxopodite, both having a cutting edge set with stiff setæ. The outer piece is the endopodite, an oval plate fringed with short soft hairs.

In front of the maxillæ and looking like another softer pair of jaw appendages is the *metastoma* (Gr. *meta*, behind, *stoma*, the mouth) (Plate B, fig. M), which forms a soft lip and consists of one median and two lateral lobes, the former being strengthened by two pairs of small sclerites.

Before removing the mandibles open and close them repeatedly to observe the points about which they move. Note on the cleaned skeleton that the lateral bulge of the carapace in front of the cervical groove is almost filled by the outer portion of the huge mandible. In front of the mouth you will see a small soft flexible upper lip or *labrum*, in which are two small symmetrical sclerites; above this is a small triangular space, part of the *epistoma*; in front of it you will see two small pointed processes of the mandible meeting in the middle line and articulating with the epistoma by a membrane throughout their whole length. On the outer hinder portion of the mandible, diagonally opposite the pointed process, you find a large pointed peg, which fits into a corresponding socket at the base of the epimeron which is here specially strengthened and calcified. On examining the endoskeleton you will find this point specially supported by stout transverse stays or apodemes, reaching from side to side of the cephalo-thoracic cavity.

On the diagonal line joining this pivot with the anterior pointed process the mandible rotates.

The whole of this large rounded piece is the coxopodite. Close to the origin of the anterior tooth-like process is a three-jointed palp. The proximal segment represents the basipodite, the distal two, the endopodite. This we learn from a comparative study of certain lower Crustaceæ, in whom we find the basal joint of the palp bearing both endopodite and exopodite. In the dried skeleton the calcified tendons of the adductor muscles remain attached to the mandibles.

We have already seen a small portion of the ventral surface of the epistome. In front it is reflected back dorsally on itself so that the whole is a flattened cone which forms part of the anterior wall of the head. The epistome is homologically the sternum of the antennary somite, but in this case owing to its reflexion it forms part of the dorsal surface of the head.

To understand the structure of the antenna, you should compare it with that of the Prawn or the Cray-fish. In these latter animals you at once recognise the homologue of the protopodite (here called the *protocerite* from the Greek *keras*, a horn or feeler), with a short *coxocerite*, on the ventral surface of which is a small nipple-like projection perforated by an opening. This opening you find on dissection leads into the duct of the kidney or "green gland." Then you have an obvious *basicerite*, to which are articulated an *exocerite* in the form of a scale or flat plate, very large indeed in the Prawn. You will readily recognise in the rest of the long feeler an *endocerite* with two large basal segments, and a long annulated terminal portion or *flagellum* (Latin, a whip).

In Palinurus you find no trace of the exocerite. You find a very long annulated feeler, sometimes a yard long, with apparently only three large basal joints. The two distal belong to the endocerite. The first movable joint has no opening for the green gland. This opening you will find on each side on a prominent little nipple near the outer angle of the large somewhat triangular plate in front of the epistoma. You find dorsally behind the antennules and in front of the eye a large plate which you do not find in the Lobster, Cray-fish or Prawn. Hence you are driven to the conclusion that the coxocerites of the two antennæ are firmly fused together and that these two plates represent the dorsal and ventral surfaces of the united coxocerites, and therefore the first movable joint is the basicerite.

Though we have for convenience numbered the antennules as if they were the appendages of a somite, they really belong to the prostomium. Those who hold the contrary view believe the sternum of the "antennulary somite" is fused with the coxocerites of the antennæ. The stem of the antennule, you will note, consists of three cylindrical segments, which therefore do not correspond to the pieces of the protopodite, only two in all the other appendages.

The basal segment is the largest. There are two rows of setæ on its inner and dorsal surfaces. At the proximal end of the dorsal surface is seen the auditory opening. Both filaments are annulated and much longer in the Indian than in the European members of the family. The inner filament is the longer.

The eye-stalks or *ophthalmites* have each two segments movable on one another. They are articulated to a median oval membranous space which looks directly upwards. In this membrane are two small median sclerites, one in front of the other behind the insertion of the eye-stalks. Those who claim an ophthalmic somite would call these the ophthalmic sternum and tergum respectively. They are sometimes united to form a single piece.

CIRCULATORY ORGANS.

To examine the heart and greater vessels cut with stout scissors along the outer side of each branchio-cardiac groove. Join these cuts by a transverse one along the cervical groove. Remove the calcified portion. Note the underlying skin spotted with red and yellow pigment. Remove this skin carefully, and you will have opened into a large cavity filled with blood, the *pericardial sinus* (Gr. *peri*, around, *kardia*, the heart).

In this sinus lies the heart, which will be found beating for some time in a recently killed animal. Its walls are thick, muscular and perforated by three pairs of openings, the *ostia* (Latin, *ostium*, a door), guarded by valves that admit the blood from the pericardium, but do not allow it to flow back when the heart contracts. Two of these ostia can be seen on the dorsum of the heart, the others are on the lateral and ventral aspects and can be seen better on further dissection.

If desired the blood vessels may be injected with thin plaster of Paris coloured with Prussian blue, or carmine, inserting the nozzle of the syringe into one of the ostia. The injection should be done slowly.

From the front of the heart a median *ophthalmic artery* is seen to run forward over the stomach to supply the ophthalmites and anterior part of the head. On each side of the ophthalmic is an *antennary artery* which passes forward to supply the green gland, antennæ, antennules, etc., of its own side. A little below and external to the antennary arteries are the pair of *hepatic arteries* which supply the digestive gland. Posteriorly the heart gives off a single large median vessel which almost immediately divides into a large *dorsal abdominal artery* which runs backwards above the intestine to supply it and the dorsal muscles, and a median *sternal artery* which runs directly downwards, sometimes to the right, more often to the left of the hind gut, to enter the sternal canal, and after passing through an opening in the large thoracic ganglion, divides into two branches, one to run forward below the nerve cord and give off branches to the legs, jaws and neighbouring structures; the other to run directly backward beneath the nerve cord and supply the abdominal appendages and ventral muscles.

All these arteries divide in the tissues they supply into smaller and smaller arteries till finally they become *capillaries* (Latin, *capillares*, hair-like) microscopic in size.

In the Vertebrates, as you are aware, the capillaries unite to form small veins, which by further union become progressively larger and return the blood to the heart. In the Crustacean this is not the case, the capillaries terminate by open mouths and allow the blood to pass into large spaces between the viscera and muscles, known as *blood-sinuses* (Latin *sinus*, a fold of a garment, a pouch or a bag). These inuses all eventually communicate with a large median longitudinal passage, the *sternal sinus*, in which the nerve cord and the two branches of the sternal artery lie. In the thorax the sternal sinus sends a vessel to each gill, which runs up the outer side of the gill-stem as an *afferent* (Latin *affere*, to bring to) *gill vessel*. In the gill the blood is only separated from the water by a thin diffusible membrane, so that an interchange of gases between the blood and the water readily takes place. Carbonic acid is given off, oxygen is taken in, and the purified blood is carried by an *efferent* (Latin *effere*, to carry away from) vessel or vein on the inner side of the gill-stem. The efferent veins from the twenty-one gills unite into six larger vessels, the *branchio-pericardiac canals*, which pour the blood into the pericardiac sinus, whence it enters the heart during diastole, and so the circulation is completed.

The efferent and branchio-pericardiac vessels can readily be injected with ink from a finely pointed medicine dropper, by cutting across the base of a gill and injecting the inner vessel. The course of the circulation in these vessels may also be demonstrated by blowing in air from a blow pipe. The air can be seen to bubble into the pericardial sinus if the sinus be filled with water.

THE GENERAL RELATIONS OF THE VISCERA.

Remove the whole carapace and the terga of the abdomen with the underlying integument. Also the extensor muscles of the abdomen.

Note the *alimentary canal*, a straight tube near the dorsal surface running the whole length of the body. Throughout the greater portion of its length it is brownish in colour and about as thick as a crow-quill. In front it is much enlarged to form the *stomach*, which fills the greater part of the head. Below the "cardiac area" of the carapace you find the *heart*, a dirty white or slightly yellowish, somewhat translucent organ, lying dorsal and posteriorly to the stomach in the *pericardial cavity*. Note the dorsal *abdominal artery*, a translucent tube running from the posterior end of the heart along the dorsal surface of the hind gut, also the three arteries running from the anterior part of the heart.

The *gonads* (Gr. *gone*, seed or reproduction) or reproductive glands, lying below a thin membrane, the floor of the pericardial sinus, and partly covered by the heart. They vary in size and colour with the seasons. In the male the testes, two long white masses, joined near the middle by a transverse median piece. In a full grown, lusty individual, they extend up on each side of the stomach in front, and behind reach into the abdomen below and at the sides of the hind gut. In shape the united testes resemble an elongated H. They are white in color and a little irregular in outline.

In the young female or in the adult out of the breeding season the *ovaries* are whitish in colour and in the same position as the testes in the male. They also consist of two long lateral lobes joined by a median bridge. In the breeding season they become very large, extending into the first abdominal somite, and deepen in colour to a salmon shade or deep coral red.

THE GENITAL DUCTS.

In the male the *sperm ducts* or *vasa deferentia* (Latin for "discharging vessels") are a pair of chalky-white very much convoluted tube arising from the lateral lobes of the testes posterior to the median bridge. The distal loop of each is much thickened and runs forward some distance before turning backwards and downwards to its opening on the coxopodite of the last walking leg. In the breeding season the terminal portion becomes of a lavender colour and greatly distended with the cheesy, almost solid semen, acting as a sperm receptacle. Its walls contain many muscular fibres and it is said to be protrusible through the very wide opening, after the manner of a penis.

In the Lobster or Cray-fish there is no protrusion, but the males bear on the first abdominal segment appendages modified into scoops, which are said to shovel, as it were, the semen into its proper position. This is an instance of *analogous* functions being fulfilled by organs in no way *homologous.*

In the female the *oviducts* are short thin tubes which run directly from the outer margins of the ovaries outwards and downwards to their openings on the coxopodites of the third pair of legs. To see the oviduct properly the liver and ovary must be pressed over from the epimeron towards the middle line with the handle of the knife. The *digestive gland* or *hepato-pancreas*, commonly called the liver, is a large, soft, yellow mass which fills up nearly all the rest of the cephalothoracic cavity.

Except the oviducts all the above organs can be seen without further dissection than opening the cavity as described above.

You should also note, on each side of the stomach, the large adductor muscle of the mandible, the attachment of which to the carapace you have cut. Separate the mandibles from one another; then with forceps pull the cut end of the muscle and observe how the mandibles are adducted or brought together in the middle line.

THE ALIMENTARY SYSTEM.

The jaw apparatus has already been described and the student will have noted that the jaws are all external to the oral opening and not, as in the Vertebrates, inside it.

The mandibles have been noted as enormous in size even for a Crustacean. Lobsters, Prawns and Crabs have large forceps, by means of which they can crush and tear their food before swallowing it. Palinurus, not being thus gifted, has some compensation in the size and power of the mandibles.

The mouth, we saw, was flanked by the mandibles and bounded in front by the fleshy labrum, behind by the metastoma. It opens into a short wide gullet or *œsophagus*, running nearly vertically upwards to enter the large gizzard or stomach which occupies the greater part of the head cavity.

We may here remind you that in the embryo of the higher animals the primitive gut or alimentary canal is lined by the inner of the three embryonic layers, the *hypoblast* or *endoderm*. The original opening into this gut becomes completely closed and it is only at a later stage that the mouth and anal openings are formed. They are formed by a dimpling or tucking in of the outer layer, the *epiblast* or *epiderm*, till it meets the hypoblast, and an opening is made where they touch. This tucking in or invagination is very shallow in most animals, much the greater portion of the digestive canal being lined by the hypoblast, only a very short distance inside the lips and anus by epiderm. In other words, the adult canal is mainly a development of the primitive gut.

In the Arthropods we have a striking contrast. The dimples in front and behind, known respectively as the *stomodœum* (Gr. *stoma*, mouth, *odaion*, a passage) and *proctodœum* (Gr. *proktos* vent, anus) become deeper and deeper till instead of being mere pits they form long tubes that eventually meet the very short primitive gut or *mesenteron* (Gr. *mesos*, middle; *enteron*, gut).

In Palinurus this mesenteron is less than a twentieth of the whole length of the alimentary canal. The œsophagus and stomach are formed from the stomodœum; the whole of the abdominal and the greater part of the thoracic gut from the proctodœum. All the epidermis we have yet studied in Palinurus both of the outer integument and of the apodemes is covered with a chitinous cuticle. That lining the alimentary canal is no exception, and is even in parts calcified to form stout teeth and plates.

The stomach is divided into a dilated anterior or *cardiac* portion and a smaller, posterior, *pyloric* portion (Gr. *pylorus*, a gate-keeper or durwan). In man and other Mammals the gullet enters the stomach just after it has passed through the diaphragm in a position quite close to the heart. Hence as anatomy was first studied in the mammals, anatomists came to call the gullet end of the stomach the "cardiac" end. Later the name was continued in this sense in describing any stomach. I need not point out that in Palinurus the "cardiac" end of the stomach is that furthest from the heart.

The chitinous lining is thick. Its calcified portions are called ossicles. They support three large and two smaller teeth, which by the action of the muscles attached to the ossicles crush and tear the food. The whole apparatus is commonly called the "gastric mill."

The gizzard and intestine should be removed, emptied of their contents and boiled for a few minutes in a solution of caustic potash or soda. This will remove all muscular and connective tissue, leaving the chitinous structures only. Wash in water and open with scissors along the mid ventral line.

You will notice externally a pouch on the dorsal surface, between the pyloric and cardiac regions. Two white T shaped calcifications will be seen, the legs of the Ts meeting at the bottom of the pouch. The cross bars of the Ts are placed transversely on the top of the cardiac and pyloric walls of the pouch respectively, they may therefore be called the *cardiac* and *pyloric ossicles.* The tail of the anterior larger T is called the *urocardiac* ossicle (Gr. *oura*, a tail); of the posterior T, the *prepyloric* on account of its position. These four pieces are movably articulated with one another. The prepyloric ossicle terminates ventrally in a strong yellow *median tooth,* which curves round the end of the urocardiac ossicle where these two legs of the Ts articulate.

From the outer ends of the transverse cardiac ossicle a *pterygocardiac* (Gr. *pteryx pterygos*, a wing) ossicle runs backwards and downwards on each side along the margin of the pouch referred to above.

From the end of the pyloric ossicle on each side runs down to meet the pterygocardiac another broader ossicle, the *zygocardiac* (Gr. *zygon*, a yoke or crossbar), the ventral portion of which appears from the interior of the stomach as a rough file-like surface and in front terminates in a large curved yellow *lateral tooth.*

Below the lateral tooth on each side is found a small pointed tooth borne on an ossicle, the inner aspect of which is setose. There are many other ossicles or sclerites in the stomach, but the above are the most important.

The transverse ossicles are acted on by muscles arising from the carapace in front and behind, as well as by muscles passing between them, which by their alternate action cause the teeth to clash together and again separate so as to thoroughly chew the food.

The passage from the cardiac to the pyloric chamber is narrowed by lateral folds and a large tongue-like valve covered with hairs on the ventral floor ; further back the pylorus is narrowed to a mere three-rayed chink by the pushing in of its roof and the presence of cushions on its sides, the whole being covered with hairs through which only very finely chewed food can filter. With the pylorus the cuticular lining ends, and the food passes into the mid-gut, the only part of the canal lined with cells of hypoblastic origin.

These cells are secretory in character and continuous with those lining the two hepatic ducts which are seen opening on the floor of the midgut. The large solid-looking yellow liver is in fact a tubular diverticulum or off-shoot of the mid-gut, which in the earliest embryonic condition is only a small pouch or tube on each side, but later on branches into an immense number of short blind tubes or *cœca* (Latin, blind), which being closely packed together form the apparently solid mass of the liver, or hepato-pancreas. The cells are of two kinds, *liver-cells* containing yellow oil globules and *ferment cells* which produce the digestive secretion.

The secretion is a slightly acid, yellowish fluid, containing many oil-globules, and possesses the power of—

(*a*) converting proteids into peptones,

(*b*) turning starch into sugar,

(*c*) emulsifying fats.

The short mid-gut is followed by the straight hind-gut or proctodæum which as already pointed out is lined with cuticle, which forms a number of longitudinal ridges set with small papillæ. The hind-gut opens on the ventral surface of the telson by a longitudinal anus.

THE EXCRETORY ORGANS.

The nitrogenous waste of the body is got rid of from the blood by the *nephridia* (Gr. *nephros*, kidney), a pair of "green-glands" whose apertures we have already seen on the ventral side of the basal joints of the antennæ.

Insert a bristle into this opening. You will find it enters a delicate thin walled sac or *bladder*, into which the secreting portion, a coiled tube lined with epithelium, discharges. The glands are of a light greenish-yellow color and lie in the extreme anterior part of the head. The stomach should be pushed back a little to see them.

THE NERVOUS SYSTEM.

After examining the heart, alimentary canal and reproductive system, the gut should be cut across about its middle and each end turned aside. The abdominal muscles should be carefully removed, when the nerve cord will be exposed lying in the middle line close to the abdominal sterna. The thoracic portion is enclosed in the central canal or tunnel formed by the endophragmal skeleton which should be removed by forceps and scissors. The brain is seen in front of the œsophagus close to the origin of the ophthalmites.

When compared with other arthropods the nervous system of Palinurus presents a very interesting study with many useful lessons on the subject of development and the origin of species.

In the Earthworm you have seen a long nerve cord stretching throughout the length of the body with a small thickening in each somite, which from its likeness to a knot on the cord is called a *ganglion*—Greek for a knot. You learned that this cord and its knots were originally a pair placed side by side, but have become enclosed in a common sheath so as to appear single. The microscope shows that in the worm the structure of cord and knot is much alike, both containing nerve-cells and nerve fibres, but in different proportions.

In the Arthropods we have a specialisation of structure in accordance with a differentiation of function. We have a series of ganglia which alone contain nerve cells, the function of which is to originate or translate nervous impulses, while in the connecting cords we have only nerve fibres whose function is simply to *transmit* impulses. Roughly the ganglia may be compared to the receivers and batteries of a telegraphic apparatus, the cords, to the wires.

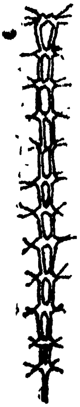


Fig. 7.—NERVOUS SYSTEM OF SANDHOPPER.

If we take one of the lower Crustaceæ such as a Sandhopper, we find it has a "brain" or *supra-œsophageal ganglion* to supply the organs of special sense in the pre-oral region, and in each segment behind the mouth we find a double cord with double ganglia lying side by side in each somite.

In the higher Crustaceæ we find a pair of ganglia in each segment, but they have coalesced to form a median mass. The double chain of connectives have approached one another in the middle line, but a separation can still be seen in the cephalo-thoracic region.

In the Lobster we find a brain in front of the gullet; two commissural nerves pass back on each side of the gullet to join a large ganglionic mass which we find is the united ganglia of the mandibular, both maxillary, and the three maxillipedary somites and supplies all six pair of jaws and foot-jaws with nerves. A double nerve commissure runs backwards to unite five other ganglia one for each of the posterior five somites of the thorax, and supply the five pair of walking legs.

In the abdomen we find six ganglia, one for each somite. The cord joining them requires very careful examination to discover it is really a pair of strands.

In Palinurus the concentration is still further marked. The brain

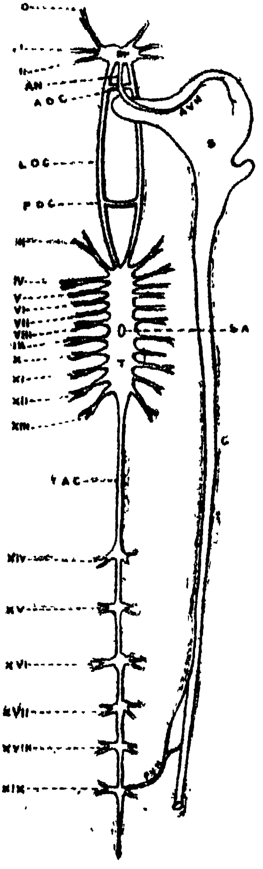


Fig. 8

Fig. 8.—NERVOUS SYSTEM OF PALINURUS.

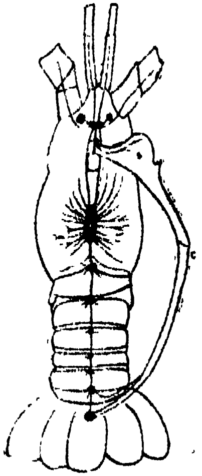


Fig 9

Fig. 9.—NERVOUS SYSTEM OF PALINURUS IN SITU.

O = Ophthalmic nerve.
I = Antennulary ,,
II = Antennary ,,
III = Mandibulary ,,
IV to XIX = Nerves to Segments.
BR = Brain.
T = Thoracic ganglion.
A V N = Anterior visceral nerve.
A N = Median root of anterior visceral nerve or azygos nerve.
A O C = Anterior œsophageal commissure.
L O C = Circum œsophageal ,,
P O C = Post-œsophageal ,,
T A C = Thoracico abdominal ,,
P V N = Posterior visceral nerve.
S A = Opening for sternal artery.
S = Stomach } turned aside.
G = Gut

or supra œsophageal ganglia form a large two-lobed mass close behind the eye-stalks. It sends out three large pair of nerves, the ophthalmic, the antennulary and the antennary whose course is sufficiently described by their names. Posteriorly it sends a *para-œsophageal* (Gr. *para*, near, beside) commissure on each side of the gullet to join a large elongated ganglionic mass on the floor of the thorax.

This represents eleven of the post-oral ganglia, those of the three jaw somites and all eight thoracic somites united together with little indication of their metameric segmentation beyond the fact that the nerves radiate out from it to the eleven pair of appendages. There is a large opening in the centre of these united ganglia through which the sternal artery descends before it divides into its anterior and posterior branches.

In the abdomen we find a ganglion for each segment, the last supplying the telson and giving a *posterior visceral* nerve to the hind-gut.

In front, the stomach is supplied by an *anterior visceral* nerve which arises by three roots,—a median one from the posterior surface of the brain, and two which arise, one on each side from the para-œsophageal connectives and run transversely in to meet one another and the median root and so form the visceral nerve. The lateral roots of the nerve meeting in front of the gullet are sometimes called the *anterior commissure.* Behind the gullet and in front of the thoracic ganglion is another transverse commissure, called the posterior.

In the Crabs, which are a higher race than Palinurus, we find a still further concentration of the nerves, all seventeen post-oral ganglia being united into a large central mass from which the nerves radiate like the spokes of a wheel.

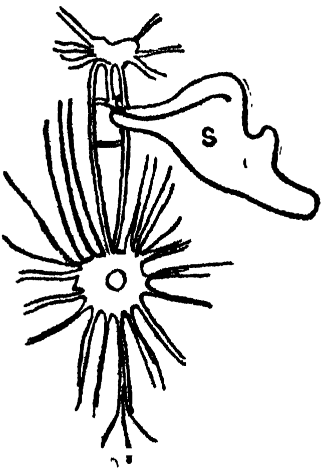


Fig. 10

Fig. 10.—NERVOUS SYSTEM OF A CRAB.

Some crabs have no hole in the large ganglion, the sternal artery passing to one side.

In the very young Palinurus we find the nerve cord double and the thoracic ganglia separate, and it is only as development proceeds that they amalgamate. Later when you study the Mosquito you will have a beautiful instance of a similar coalescence of the ganglia which you can actually see take place, the separate thoracic ganglia of the larva, rapidly closing up and amalgamating in the pupa in the course of a few hours.

We have now learned that in the course of development of the individual Palinurus, the separate ganglia of the somites of the larva coalesce to form the large ganglion of the adult. We have also seen that in the "lower" earlier or more primitive type of Crustacean like the Sand-hopper the ganglia of each somite are separate and paired as is also the connecting cord. We have in the higher Lobster a further degree of concentration, the six ganglia behind the mouth having coalesced. In the Prawn, Palæmon, we have a stage intermediate between the Lobster and Palinurus, as the ganglia of the post-oral somites of the cephalo-thorax have all united, but the union is indicated by distinct indentations. Then above Palinurus we have in the Crab all seventeen post-oral ganglia united into a single mass with practically no indication of metamerism though in the larva it is distinct.

Now in Mr. Darwin's theory of the origin of species it is assumed that the higher types such as the Crabs have developed through past ages by a succession of stages through ancestors *resembling* or *common* to such *lower* animals as Palinurus, Prawn, Lobster and Sand-hopper. In seeking to explain the origin of any species you will be greatly helped by the rule of which we have now seen an excellent example, that the *course of the development of an individual from the egg through its embryonic or larval stages up to that of the adult is an epitome of and furnishes a clue to the history of the development of the species.*

THE REPRODUCTIVE ORGANS.

These have been already described with the topographical anatomy of the cephalo-thorax. It should be further noted that the gonads are hollow organs continuous with their ducts. You have seen in the Earthworm, Frog and Rabbit types that the ova are discharged into the cœlom and taken thence to the exterior by their ducts.

You have seen in Palinurus the body-cavity is not lined with epithelium as in these three types, but is continuous with the cavity of the blood-vessels. It is therefore not homologous with the cœlom, and may be called the *hæmocœle* (Gr. *haima*, blood, *koiloma*, a cavity).

The homologue of the cœlom in Palinurus is to be found in the cavity of the gonads and of the green glands.

In some of the segmented worms, we find the nephridia utilised for the discharge of the generative products, ova and spermatozoa. It is a characteristic of cœlomate animals that both the renal and reproductive organs are derived from the epithelium of the cœlom.

It is therefore not surprising, when we find such distinct evidence of serial homology between the gonads and nephridia in the sea worms, to find a certain homology between the green glands and the gonads of Palinurus, such as their cavities representing the cœlom and their ducts opening in homologous situations, the basal joints of appendages.

DEVELOPMENT.

The female lays an enormous number of coral-colored eggs, probably about a lakh each season. The egg is a single large cell containing in addition to its nucleus and nucleolus a large amount of yolk granules. After fertilisation by the spermatozoon, segmentation commences. In many animals segmentation begins by the complete division of the cell including the yolk into two new cells. This is known as *complete* division.

In Palinurus as in most Arthropods segmentation is *incomplete*. The nucleus divides and subdivides repeatedly till we have a large number of nuclei, the cytoplasm and yolk not being divided up into cells. These nuclei all approach the surface, and later with the protoplasm around them give rise to a *germinal layer* of cells surrounding the yolk. This central yolk forms a number of cones the base of each being applied to the inner aspect of a germinal cell. The whole embryo is now a hollow bag, formed of a single layer of cells known as the *blastoderm* (Gr. *blaste*, a bud, sprout or development, *derma*, a skin or layer) its cavity stuffed with nutrient material.

At one pole of the blastoderm an oval patch, the *germinal disc* is formed by a thickening of the layer of cells. At one end of the disc a pitting or dimpling takes place and gradually deepens to form a small wide-mouthed pouch. This stage is known as the *gastrula*, (Latin, a little belly) and may be illustrated by pressing in one pole of a soft tennis ball.

This pouch, the *primitive gut* or *archenteron* (Gr. *arche*, origin, primitive state, *enteron*, gut) continues to deepen and its mouth to contract till we get a completely closed sac.

The cells lining the primitive gut are known as the *hypoblast* or *endoderm* (Gr. *hypo*, under, *endo*, inner). The remaining cells of the blastoderm are the *epiblast* or *epiderm* (Gr. *epi*, above) from which is eventually developed the epidermis of the integument, of the fore-gut, of the hind-gut and the nerve system. A mass of cells appears between the hypoblast and epiblast near the blastopore, probably derived from the former ; from it the muscles, connective tissues, heart, vessels and reproductive organs are developed. It is called the *mesoblast* (Gr. *mesos*, middle).

In front of the blastopore, before it closes an elevation appears which lengthens in a forward direction. This is the rudimentary abdomen. In front of this again a pair of flatter elevations appear one on each side of the middle line called the *head lobes*. A median linear depression appears on the surface of the epiblast between these three elevations. Near its centre the groove deepens into a tubular ingrowth, the stomodæum, as already described. The primitive hind-gut arises in a similar manner on the abdominal papilla. A considerable time elapses before the partitions between the three portions of the gut disappear. The appendages appear as symmetrical pairs of buds of the epiblast and mesoblast. Those of the antennules, antennæ and mandibles appear early. The eyestalks appear later as outgrowths of the head lobes.

The epiblast on each side of the median ventral groove thickens in two longitudinal strands to form the double nerve chain, which later severs its connection with the tegumentary epiderm.

The eggs of many Crustaceæ, for instance Penæus, one of the Prawns, are hatched in an elementary stage with only the three anterior pair of appendages, which become very large and are used in swimming. This is known as the Nauplius stage. In Palinurus as in Lobsters, Crayfish, the Prawn, Palæmon and most of the other *Macrura* (Gr. longtails) this stage is passed inside the egg.

Owing to the fact that the larvæ of Palinurus are inhabitants of the open sea, the full course of their development has not been studied. Only recently it has been recognised that the little *Phyllosoma* (Gr. *phyllon*, a leaf, *soma*, body) is the larva of Palinurus or its near relatives. These larvæ were formerly thought to be a separate genus and are popularly known as "Glass-Crabs."

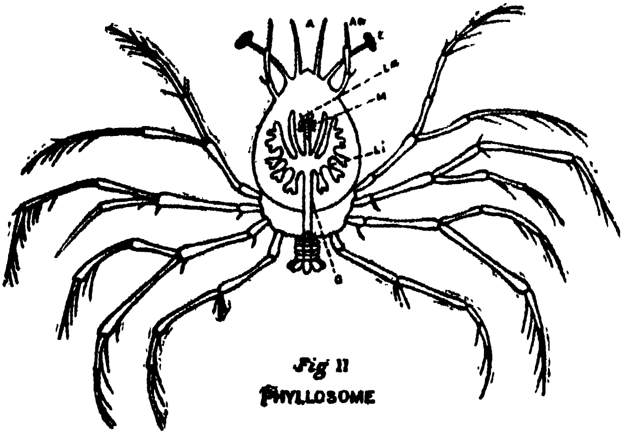


Fig. 11.—PHYLLOSOME.

A = Antennule.

A a = Antenna.

E = Eye.

L a = Labrum.

M = Mandible.

L i = Liver.

G = Gut.

Both the scientific and popular names are very descriptive, as the animal is extremely flattened and the greater part of its body consists of two large transparent discs resembling small watch glasses.

These discs represent the carapace. The anterior corresponding to the cephalic portion, is oval or nearly circular and covers the stomach, liver and head appendages. The posterior is the thoracic region: it contains the heart and intestine, and bears the eight thoracic appendages, which it is interesting to note have both endopodite and exopodite at this stage. In earlier specimens the first maxilliped and last walking leg are rudimentary. The junction of the two discs is the cervical groove in which the scaphognathite can be seen moving.

The eyestalks are of great length; they, the antennules, and the antennæ are all borne on the anterior margin of the carapace. You will note the gradual shifting of the position of the eyes from the ventral surface of the embryo in the egg to the anterior margin in the phyllosome and finally to the dorsal surface of the adult.

The liver can be seen through the transparent disc as a more or less branched diverticulum of the mid-gut.

The abdomen is very small, and you can see six pair of small appendages, the pair of the first somite disappearing before the adult condition is reached. In most phyllosomes the posterior margin of the hinder disc is notched to receive the abdomen.

The nerve cord is double ; in the specimen sketched there were six distinct thoracic ganglia. The reproductive organs cannot be recognised.

The phyllosome stage lasts a month or two, during which time it moults about four times ; at the last moult the discs exchange for a carapace of the adult pattern.

The phyllosomes sketched should not as yet be definitely regarded as those of the species or perhaps the genus described. The phyllosomes of the various members of the family have not yet been differentiated.

CONTRIBUTIONS TO THE FLORA OF NORTH COIMBATORE.

(FROM MATERIALS SUPPLIED BY C. E. C. FISCHER, I.F.S.)

BY

E. BLATTER, S.J.

(With a Map—Plate A.)

Mr. C. E. C. Fischer is known to the readers of our Journal by his valuable "Notes on the Flora of Northern Ganjam[1]" in which he gave us a list of over 800 indigenous plants. Early in 1905 he was transferred to Coimbatore. Here he made an extensive collection of plants in the northern part of that District and gathered notes on the elevation and flowering time of the single species. It is to be regretted that, in April 1907, he was called to Dehra Dun to replace temporarily Mr. Stebbing as Professor of Entomology. Before leaving Coimbatore, Mr. Fischer offered me his notes, with the intention of giving me further materials towards the elucidation of the relations between flowering season and climate. I shall, with pleasure, make use of his notes; but I have been considering, at the same time, what Hooker and Thomson complained of half a century ago: "We have long deplored the defective geographical nomenclature adopted in almost every work treating of the Natural History of India, and the fact that 'E. Ind.' or 'Ind. Or.' is considered in most cases sufficiently definite information as to the native place of any production found between Ceylon and Tibet, or Cabul and Singapore.[2]" This important defect has been remedied to some extent during the last 30 years, but, still, our information with regard to the exact distribution of the different species in India is far from being complete; and it is especially the Deccan of which so little is known in this respect that it is impossible to describe the limits and botanical characters of the sub-regions in a satisfactory way.[3] In order to contribute a little to our knowledge in this direction, I asked the Editors of our Journal to publish the whole, though incomplete, catalogue of the plants of Coimbatore; and I feel confident that it will be welcome to many botanists, and especially to those that intend to compile a regional Flora. Northern Coimbatore covers a comparatively small area, and besides, the notes on elevation and flowering time are, perhaps, the first contribution from that country.

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[1] Cf. Vol. XV., p. 537; Vol. XVI., p. 478.

[2] J. D. Hooker and Thomas Thomson: Flora Indica, Introductory Essay, p. 2, (1855).

[3] "Deccan" is taken in a very broad sense, as laid down by J. D. Hooker in his sketch of the Flora of British India, *i.e.*, "the whole comparatively dry elevated table-land of the Peninsula east of Malabar and South of the Gangetic and Indus Plains, together with, as a sub-region, the low-lying strip of coast land extending from Orissa to Tinnevelly, known as the Coromandel Coast."—Cf. Imperial Gazetteer, Vol. I, new edition, p. 186.

The history of the botanical exploration of Coimbatore can be told in a few words. As far as we know it has never been examined systematically, and if Coimbatore is mentioned sometimes in a few works on Indian plants as a place in which a species has been found, it was done quite incidentally. The first that paid some attention to the vegetation of that country is Dr. F. Buchanan[1], a medical officer of the Bengal Army. In 1800 and 1801 he made, under the orders of the Marquis of Wellesley, a journey from Madras through the countries of Mysore, Canara, and Malabar, "with the express purpose," as he says himself, "of investigating the state of agriculture, arts, and commerce, the religion, manners, and customs, the history, natural and civil, and antiquities." His tour brought him also to Coimbatore, but only to the southern and central parts. His diary contains much information on the agricultural products of the country and some notes on its forests [2]. Similarly the "more unknown" plants received his attention. "I transmitted," he says, "a considerable number of seeds to Dr. Roxburgh[3], and made a collection of descriptions and drawings of the more unknown plants. These last it was my intention to have published with this work; but the booksellers declining to incur the necessary expense, I have given them to my friend Dr. James Edward Smith[4], who, I hope, will publish some part in his Exotic Botany[5]. I need hardly mention that the Herbaria of N. Wallich, a medical officer of the Bengal Army, and of R. Wight of the Madras Medical Service, contain specimens collected in Coimbatore. The latter resided for a long time at Coimbatore as Superintendent of the Government Cotton plantations. In 1861, Hugh Cleghorn, Conservator of Forests of the Madras Presidency, published "The Forests and Gardens of South India." The book is "simply a compilation of papers, commencing with three annual reports, which indicate the progress of the (forest) department, and which are followed by a memorandum on Kumari,—an injurious practice, which destroys vast quantities of the most valuable timber,—and by other memoranda bearing more or less on the subject of Indian forests.[1]" On page 123, Cleghorn gives the "Rules for the preservation of jungles in the District of Coimbatore" and, later on, he adds the report on the Madras Exhibition of timbers and ornamental woods, in which we find the following relating to Coimbatore: "The collection from Coimbatore, Kistna Maramut supt. exhibitor, consists of 34 specimens, about 13 inches long, with a cross section of 3 inches square. Great pains appear to have been taken in the preparation of these samples, and in the determination of the names. Almost all the trees best known and most highly valued in this part of India are represented in this collection.[2]" In 1858, Cleghorn with several friends undertook an "Expedition to the higher ranges of the Anamalai Hills" of Coimbatore. A very instructive description of the tour, with special reference to the botanical features of the country, was read by Cleghorn to the Royal Society of Edinburgh, the 29th April 1861.[3] "The ferns of Southern India" by R. H. Beddome, Conservator of Forests of Madras, and "The Flora Sylvatica of Southern India" by the same author, are well-known contributions to the Flora of the Madras Presidency.

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[1] Cf. Francis Buchanan: A journey from Madras through the countries of Mysore, Canara, and Malabar. London, 1807.

[2] F. Buchanan, l. c. Vol. II, chapters IX, X.

[3] William Roxburgh, who had come out to India in the medical service of the East India Company, had been removed from Samulcottah to Calcutta in the autumn of 1793 where he was in charge of the botanic garden till 1814.

[4] Sir James Edward Smith is known as the purchaser of the collections and library of Linnæus and the founder of the Linnean Society in 1788. I am not able to ascertain whether Roxburgh's collection of descriptions and drawings has ever been published by Smith.

[5] F. Buchanan, l. c. Vol. I, Introduction, p. XIII.

In order to understand the composition and character of the Flora, we now proceed to give the physical and meteorological features of the District.[4] Coimbatore is situated between 10° 14′ and 12° 19′ N. Lat., and 76° 35′ and 78° 14′ E. Long., its area being 7,860 square miles. It is bounded on the north by the territory of Mysore and the river Cauvery, on the east by the Cauvery, which divides it throughout its whole extent from Salem, on the south by the District of

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[1] Hugh Cleghorn, the Forest and Gardens of South India. London, 1861, p. XI.

[2] Cleghorn, l. c., p. 249.

[3] Transactions of the Roy. Soc. of Edinb., Vol. XXII.

[4] Cf. Pharoah & Co.: A Gazetteer of Southern India, Madras, 1855. Madras District Gazetteers, Coimbatore, Vol. II, Madras, 1905. H. F. Blanford: The Climate and Weather of India, Ceylon and Burma, London, 1889.

Madura and the State of Travancore, on the west by the Nilgiris, Malabar District, and the State of Cochin. The northern portion of the District forms an elevated table-land, separated from the Mysore plateau by the Biligiri-Rangan and other hill ranges. It has a northerly slope, and presents throughout an undulating surface, with an average elevation of 2,500 feet above the rest of the District. The Biligiri-Rangan hills consist of a double range, with ridges rising to 5,000 feet and more in height, one even reaching 5,973 feet. The two ranges are separated by a valley 4,000 feet above the sea. It is filled with heavy forest and high grass. From here, two passes, the Hassania and Burghur ghats, lead into the low country. The plain is slightly undulating and sloping eastwards from the town of Coimbatore (1,431 feet above the sea) to Karur (380 feet).[1] On the western boundary of the District lie the Nilgiris. The most conspicuous point is Lambtan's Peak, a narrow ridge 5,000 feet high. Next to these is the Anamalai range, in the southern part of the district. The principal rivers watering this District are the Cauvery, the Bhavani, the Noyil, and the Amravati. The Cauvery has its source near Mercara in Coorg, and after passing the Eastern Ghats, runs for 180 miles along the eastern frontier of the District. Nearly the whole year it supplies the neighbouring country with plenty of water for the purpose of cultivation by irrigation. It deposits, besides, a rich fertile clay, formed from the felspar which predominates in the granites of the south, and intermixed with decomposed calcareous conglomerate. The other rivers are tributaries of the Cauvery, as are also the numerous jungle streams and hill watercourses, which have their sources generally amongst the western mountains. A great number of lakes or tanks, with numerous canals given off from the different rivers, help to increase the growth of vegetation.

The soils of the District are chiefly a rich red soil mixed with sand and a kind of agglutinated conglomerate, and a red soil mixed with gravel, the gravel consisting almost entirely of small pieces of quartz and small-grained granite; sometimes it is mixed with a considerable portion of sand. These soils do not usually retain their moisture for a long time, and vary much in depth; the underlying rock is nearly always granitic, and is in some places very near the surface, whereas in other places the soil reaches to a depth of from 20 to 25 feet. A third soil consists almost entirely of sand and gravel; whereas a fourth kind, the so-called cotton-soil, is a black alluvial clay which retains moisture for a long time, and has, besides, the power of absorbing moisture from the atmosphere.

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[1] Imperial Gazetteer, I. ed.

It is to be regretted that Indian Botanists, on the whole, paid very little attention to the relations which exist between the vegetation of the various regions and its edaphic conditions. The consequence is that we are not able, as yet, to say how the different soils influence and modify physically and chemically the Floras of various areas in the Tropics. Kurz[1] and Brandis[2] made a start in India, but theirs are the only contributions in this direction as far as I know[3].

The climate of Coimbatore differs in many respects from that of the neighbouring countries. Before we are going to describe it in detail, we shall give a table showing the average rainfall in that part of the District, which has been visited by Mr. Fischer. It is shown on the map as lying north of the line drawn from near Mettapalayam across the country to the boundary line between Madura and Trichinopoli, including also a small part of the Nilgiris with the two elevations marked as 4,000′ and 5,000′ (*vide* Plate A).

Average Rainfall (1870—1903) in inches.

STATIONS[4].	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Whole Year.
Gopichettipalayam	0·21	0·36	0·75	2·22	3·52	1·68	1·15	3·14	5·73	7·48	3·92	1·08	31·29
Satyamangalam ..	0·44	0·47	0·53	1·65	3·45	1·53	1·11	2·30	3·98	7·25	4·60	0·98	28·24
Talavadi	0·18	0·13	0·76	2·94	5·61	1·57	1·28	3·07	5·81	6·49	2·80	1·26	31·90
Bhavani	0·15	0·37	0·68	2·08	3·56	1·37	1·99	3·46	4·48	6·29	3·90	1·15	29·87
Erode	0·09	0·12	0·45	2·07	3·70	1·57	1·69	3·58	14·1	6·10	3·73	1·24	28·50
Karur	0·16	0·19	0·23	1·41	3·45	1·35	0·47	3·22	4·10	6·18	3·67	1·47	26·40
Kollegal	0·15	0·17	0·80	1·96	5·69	2·38	2·26	4·47	6·49	7·28	2·80	0·66	35·06
Palladam	0·22	0·39	0·46	1·58	2·89	0·81	0·36	1·05	3·14	6·07	3·70	1·18	20·86
Total Average ..	0·21	0·27	0·58	1·99	3·98	1·59	1·35	2·90	4·61	6·63	3·76	1·12	29·02

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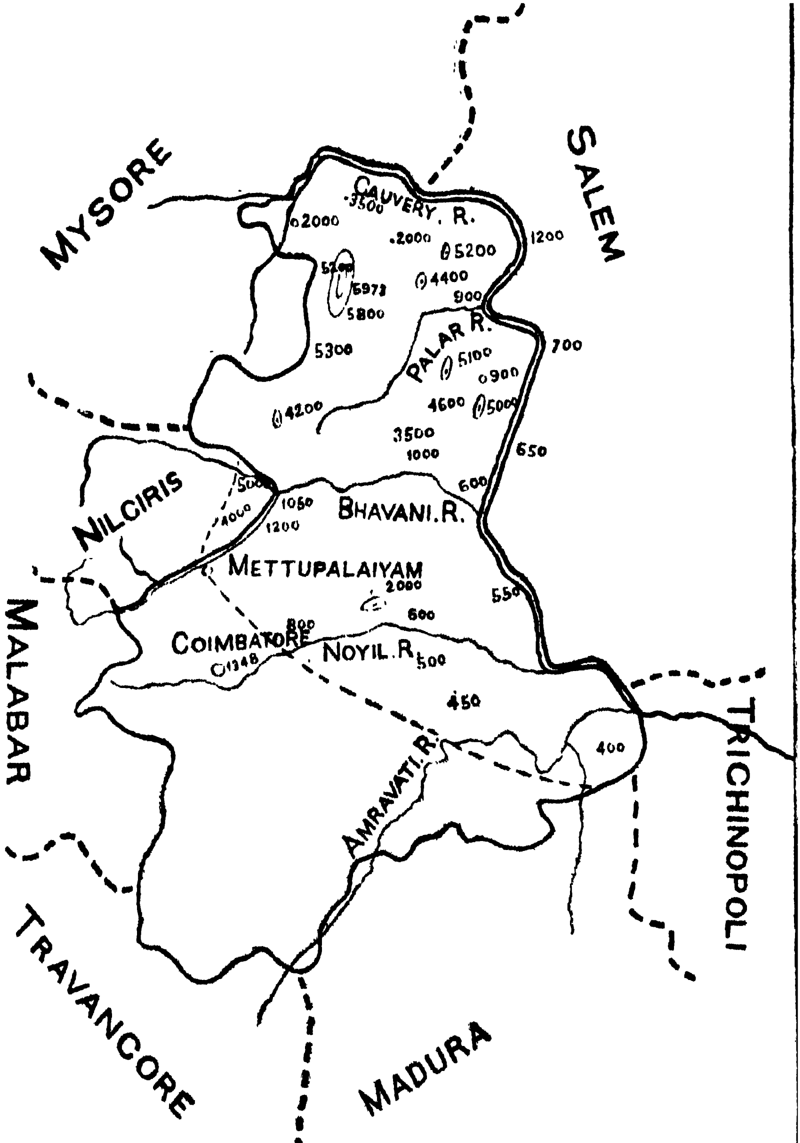
[1] S. Kurz: Preliminary report on the forest and other vegetation of Pegu, Calcutta, 1875. cf. also: S. Kurz: Forest Flora of British Burma.

[2] D. Brandis: Die Familie der Dipterocarpaceen und ihre geographische Verbreitung. Sitzungsbericht d. niederrhein. Gesellsch. für Natur-und Heilkunde zu Bonn, 1896.

[3] We must, of course, not forget the work done by the Agricultural Department by experimenting on and analysing the soils in many parts of India, and there is no doubt that it will prove useful also for our purpose: but it has, naturally, been carried on with special reference to the agricultural products only, and the results have not been applied as yet to the wild-growing plants.

[4] District Gazetteers, Coimbatore, Vol. II, 1905.



MAP OF COIMBATORE

Scale 1 inch = 32 Miles

The numbers give the elevation in feet

Coimbatore is remarkable for the comparatively cool winds which blow across it from the west between May and October. The summer monsoon brings its rain to Malabar, and up to the range of hills separating that District from Coimbatore ; but there it stops, a cold damp wind with very little rain blowing during the monsoon months over the plains of Coimbatore. Thus after the hot months of March and April, the temperature suddenly falls, and remains low till October.[1] The winter monsoon commonly commences about the middle of October. The rains then swell the rivers, and the tanks and low grounds of the District receive their great annual supply of water. The end of December, when the winter monsoon rains are over, is the coldest season in the year, the range of the thermometer being from 62° to 80°, sometimes as low as 55°.

As there are no meteorological data on temperature, humidity, and clouds of North Coimbatore at my disposal, I shall give a climatic table of the town of Coimbatore (1,348 feet above sea level). I have been told by Mr. Fischer that the meteorological conditions of that place prevail practically throughout the area east and south of the Bhavani river.

	Temperature.					Humidity.	Cloud.	Rainfall.	
	Mean	Mean Max.	Mean Min.	M. Range.					
				Daily.	Monthly.			Inches.	Days.
January	74	87	64	23	34	59	3·4	0·8	1
February	77	92	65	27	37	52	2·4	0·1	1
March..	81	97	70	27	36	54	2·9	0·6	3
April	83	98	74	24	32	58	4·9	1·8	4
May	81	95	74	21	32	65	5·4	2·6	10
June	78	90	72	18	26	71	6·6	1·8	9
July	77	89	71	18	23	72	6·5	1·3	9
August	77	88	71	17	25	73	6·1	1·2	8
September	77	90	71	19	30	71	5·7	1·2	6
October	77	88	72	17	26	75	6·3	5·7	15
November	76	86	69	17	27	74	6·1	3·4	13
December	74	85	66	19	31	66	4·0	1·1	6
Year ..	78	..	..	..	..	66	5·0	21·	85

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[1] Imperial Gazetteer, Coimbatore, I. ed.

A comparison of the meteorological conditions of Coimbatore with the flowering season of its Flora leads us to the same results we arrived at in Vol. XVII. of this Journal. The following table will show the flowering times of the woody as well as the herbaceous plants for the different months, the monthly rainfall of North Coimbatore, and the temperature and humidity of Coimbatore Town.

	Jan.	Feb.	March	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Flowering times of the woody plants.	49	42	97	178	146	118	80	100	105	129	119	75
Flowering times of the herbaceous plants	116	89	69	92	128	112	117	152	186	210	264	160
Rainfall of North Coimbatore ..	0·21	0·27	0·58	1·99	3·98	1·59	1·35	2·90	4·61	6·63	3·76	1·12
Humidity of Coimbatore Town ..	59	52	54	58	65	71	72	78	71	75	74	68
Temperature of Coimbatore Town ..	74	77	81	83	81	78	77	77	77	77	76	74

Both the woody and herbaceous plants show two maxima of flowering times : the woody plants, a high maximum in the dry and warm month of April, and a low maximum in October after a season of comparatively much rain; whereas the herbaceous plants have a low maximum in May after a small amount of rain, and a high maximum after the heavy rains of the winter monsoon.

In the subjoined catalogue the flowering season is given according to months. As to elevation, the lowest and highest points at which a certain species was found are usually given. In a good many cases only one elevation is added, which means that a plant has been seen at that point at one occasion only, or several times at approximately the same elevation.

——	Flowering time.	Elevation in feet.
1. *Ranunculaceæ.*		
1. Clematis gouriana, Roxb.	11—12	3,400—5,900
2. „ wightiana, Wall.	2— 3	5,000—5,900
3. Naravelia zeylanica, DC.	12	3,200—4,200
4. Thalictrum javanicum, Blume	8	4,600—5,300
5. Ranunculus diffusus, DC.	8	5,000

——	Flowering time.	Elevation in feet
2. *Magnoliaceæ.*		
6. Michelia nilagirica, Zenk.	2— 5	3,000—5,000
3. *Anonaceæ.*		
7. Polyalthia cerasoides, B. & H.	4	2,400—3,600
8. Goniothalamus wightii, H. f. & T.	3	5,000
9. Anona squamosa, L.	7	450—1,300
10. Miliusa indica, Lesch.	9—12	3,300—4,200
11. Saccopetalum tomentosum, H. f. & T.	4	2,500—3,600
4. *Menispermaceæ.*		
12. Tinospora cordifolia, Miers.	2—11	2,000—2,800
13. Cocculus macrocarpus, W. & A.	3	3,500—4,500
14. „ laurifolius, DC.	3	4,000—5,000
15. „ villosus, DC.	11— 2	600—2,500
16. „ leæba, DC.	10	450— 700
17. Stephania hernandifolia, Walp.	5— 8	3,700—5,000
18. Cissampelos pareira, L.	4— 8	2,800 - 4,000
19. Pachygone ovata, Miers	12— 1	600—3,400
5. *Berberidaceæ.*		
20. Berberis nepalensis, Spreng.	2	4,000—4,800
21. „ aristata, DC.	4	4,000—5,000
6. *Nymphæaceæ.*		
22. Nymphæa lotus, L.	7	2,000—3,500
23. „ stellata, Willd.	12	2,000—3,500
24. Nelumbium speciosum, Willd.	4	2,000
7. *Papaveraceæ.*		
25. Argemone mexicana, L.	1—12	450—3,600
8. *Cruciferæ.*		
26. Cardamine africana, L.	11	5,100
9. *Capparidaceæ.*		
27. Cleome monophylla, L.	4—10	2,000—3,600
28. „ aspera, Koenig	9—10	600—1,000
29. „ felina, L.	6—10	600—2,000
30. „ viscosa, L.	5—10	600—2,500
31. „ chelidonii, L.	10	1,000—1,400
32. Gynandropsis pentaphylla, DC.	5—10	650—1,400
33. Maerua ovalifolia, Camb.	1	600— 800
34. Cadaba indica, Lamk.	4—12	650—3,000
35. Capparis spinosa, L.	3	2,900
36. „ grandiflora, Wall.	3— 5	1,900—4,000

	——	Flowering time.	Elevation in feet.
	9. *Capparidaceæ*—contd.		
37.	Capparis divaricata, Lamk.	3— 5	1,000—3,000
38.	„ grandis, L.	5	2,000—3,500
39.	„ sepiaria, L.	4— 5	1,000—3,400
40.	„ horrida, L.	3. 11	2,400—4,000
41.	Cratæva religiosa, Forst.	3	600—1,300
	10. *Violaceæ.*		
42.	Viola serpens, Wall. (run wild)	5	5,000—5,700
43.	Ionidium suffruticosum, Ging.	1—12	500—3,000
	11. *Bixaceæ.*		
44.	Cochlospermum gossypium, DC.	2— 3	2,500—4,000
45.	Scolopia crenata, Clos.	6	3,800
46.	Flacourtia ramontchi, L'Herit.	4— 6	3,300—4,200
	,, ,, var. sapida	2—10	3,500—4,200
47.	,, sepiaria, Roxb.	12	4,000
	12. *Pittosporaceæ.*		
48.	Pittosporum tetraspermum, W. & A.	9—10	3,800—4,000
49.	,, floribundum, W. & A.	5—12	3,300—4,000
	13. *Polygalaceæ.*		
50.	Polygala arillata, Ham.	5—11	5,000—5,400
51.	„ persicariæfolia, DC.	5—11	2,000 4,800
52.	„ leptalea, DC.	4— 5	1,800—3,900
53.	„ erioptera, DC.	4—12	3,000—3,700
54.	„ elongata, Klein.	7	2,000
55.	„ chinensis, L.	4—10	1,500—3,600
56.	„ rosmarinifolia, W. & A.	9	4,000—5,000
	14. *Caryophyllaceæ.*		
57.	Cerastium vulgatum, L. var. glomeratum, Thuill.	11	5,000—5,700
58.	Polycarpon lœflingiæ, B. and H. f. (?)	7	2,000
59.	Polycarpæa corymbosa, Lamk.	4— 1	600—2,200
	15. *Portulacaceæ.*		
60.	Portulaca oleracea, L.	4— 7	1,900—3,500
	,, ,, var. erecta	10	500
61.	,, quadrifida, L.	5	1,000—2,000
62.	„ suffruticosa, W.	5—12	1,000—2,000
	16. *Elatinaceæ.*		
63.	Bergia ammannioides, Roxb.	1	650

———	Flowering time.	Elevation in feet
17. *Hypericaceæ.*		
64. Hypericum mysorense, Heyne	3— 9	4,600—5,900
65. „ japanicum, Thunb.	3	3,500
18. *Dipterocarpaceæ.*		
66. Shorea talura, Roxb.	......	2,600—4,000
19. *Malvaceæ.*		
67. Malva parviflora, L.	9—10	3,400—4,200
68. Sida veronicæfolia, Lamk.	3	1,800—2,300
69. „ glutinosa, Cav.	10—11	2,000—3,600
70. „ spinosa, L.	4—11	1,000—4,000
71. „ carpinifolia, L.	4—10	3,000—3,600
72. „ rhombifolia, L.	6	3,700—4,300
„ „ var. retusa	11	3,700—4,300
73. „ cordifolia, L.	7—12	2,000—3,000
74. Abutilon indicum, G. Don.	5	3,000—3,500
75. „ polyandrum, Schlecht.	12— 2	2,700—5,000
76. „ graveolens, W. & A.	11—12	3,500—4,000
77. „ crispum, G. Don.	9—11	900—2,600
78. Urena lobata, L.	10	3,400—4,000
79. „ sinuata, L.	4—12	3,400—4,000
80. Pavonia glechomifolia, A. Rich.	6—11	1,200—2,200
81. „ zeylanica, Cav.	6	2,600
82. „ odorata, Willd.	4— 6	2,500—3,500
83. Decaschistia crotonifolia, W. & A.	5	3,300—4,500
84. Hibiscus furcatus, Roxb.	8—11	2,000—4,000
85. „ micranthus, L.	1—11	900—3,000
86. „ solandra, L'Herit.	6—12	2,000—4,000
87. „ canescens, Heyne	4—10	1,000—1,800
88. „ collinus, Roxb.	10	3,000—3,600
89. „ lunariifolius, Willd.	12	2,600—3,400
90. „ panduræformis, Burm.	11—12	2,200—3,400
91. „ vitifolius, L.	4— 6	2,300—3,600.
92. „ ficulneus, L.	12— 2	600—2,500
93. „ rugosus, Mast.	12	4,460
94. „ angulosus, Mast. var. purpureus, Thw.	11	5,000
95. Thespesia macrophylla, Blume	12	3,000
96. „ populnea, Corr.	5	550—2,000
97. Kydia calycina, Roxb.	9—10	3,000—5,000
98. Bombax malabaricum, DC.	3	2,000—4,000
20. *Sterculiaceæ.*		
99. Sterculia urens, Roxb.	1	900—3,000
100. „ guttata, Roxb.	2	4,500—5,300
101. Helicteres isora, L.	8—11	1,900—4,000
102. Eriolæna stocksii, H. f. & T.	5—10	3,000—4,500
103. „ quinquelocularis, W.	4— 5	3,000—4,500
104. Melhania incana, Heyne	6—10	1,200—2,800

		Flowering time.	Elevation in feet.
	20. *Sterculiaceæ*—contd.		
105.	Melochia corchorifolia, L.	10—12	600—2,800
106.	Waltheria indica, L.	4—10	2,000—4,000
107.	Buettneria herbacea, Roxb.	4—11	2,500—3,800
	21. *Tiliaceæ.*		
108.	Grewia lævigata, Vahl.	6— 8	3,000—42,000
109.	„ heterotricha, Mast.	10	900—1,500
110.	„ populifolia, Vahl	5. 10	1,000—2,000
111.	„ salvifolia, Heyne	11	1,000
112.	„ tiliæfolia, Vahl	4	2,000—4,000
113.	„ pilosa, Lam.	6. 10	900—3,800
114.	„ bracteata, Roth.	4— 6	1,000—2,400
115.	„ villosa, Willd.	4— 9	600—2,000
116.	„ abutilifolia, Juss.	6. 10	3,300—3,800
117.	„ hirsuta, Vahl.	4. 10	1,100—2,700
118.	„ umbellifera, Bedd. ?	5	1,000
119.	Triumfetta pilosa, Roth.	10—12	4,000—5,500
120.	„ rhomboidea, Jacq.	8—11	3,000—5,000
121.	„ rotundifolia, Lam.	1. 9	600—1,400
122.	Corchorus olitorius, L.	10—11	600—4,000
123.	„ trilocularis, L.	1— 8	1,300—3,600
124.	„ urticæfolius, W. & A.	10	600
125.	„ fascicularis, Lam.	11— 1	1,300—2,400
126.	„ acutangulus, Lam	10— 1	1,000—1,400
127.	„ tridens, L.	6. 10	600—1,400
128.	Elæocarpus serratus, L.	8—11	4,500—5,200
129.	„ tuberculatus, Roxb.	3	4,200
	22. *Linaceæ.*		
130.	Linum mysorense, Heyne	11	4,800—5,600
131.	Hugonia mystax, L.	6— 9	900—1,300
132.	Erythroxylon monogynum, Roxb.	4—10	1,500—3,600
	23. *Malpighiaceæ.*		
133.	Hiptage madablota, Gaertn.	4—11	3,400—4,200
	24. *Zygophyllaceæ.*		
134.	Tribulus terrestris, L.	4—10	600—2,000
	25. *Geraniaceæ.*		
135.	Oxalis corniculata, L.	4—12	1,000—4,000
136.	„ acetosella, L. (run wild ?)	11	5,000—5,700
137.	„ violacea, L. (run wild)	11	5,000—5,700
138.	Biophytum sensitivum, DC.	6	3,700
139.	„ reinwardtii, Walp.	8—10	3,000—4,000
140.	Impatiens acaulis, Arn.	8—11	4,800—5,500
141.	„ balsamina, L.	8—11. 2	3,500—5,000

	——	Flowering time.	Elevation in feet.
	26. *Rutaceæ.*		
142.	Toddalia aculeata, Pers.	3— 9	600—5,000
143.	Murraya exotica, L.	5— 8	3,500
144.	„ Koenigii, Spreng.	5	2,400—5,000
145.	Clausena indica, Oliv.	6. 9	4,100
146.	„ willdenovii, W. & A.	4	4,000
147.	Limonia acidissima, L.	4— 6	2,000—4,200
148.	„ alata, W. & A.	1— 3	700—1,200
149.	Atalantia monophylla, Correa	10	600—1,000
150.	„ racemosa, W. & A.	5	4,800—5,200
151.	„ ceylanica, Oliv.	5	4,800—5,200
152.	Citrus medica, L. var. acida	9	1,000
153.	Feronia elephantum, Correa	3	1,000—3,000
	27. *Simarubaceæ.*		
154.	Ailanthus excelsa, Roxb.	1	600—3,500
155.	Balanites roxburghii, Planch.	3— 5	1,000—3,400
	28. *Ochnaceæ.*		
156.	Ochna wightiana, Wall.	4	2,500—2,800
	29. *Burseraceæ.*		
157.	Boswellia serrata, Roxb.	1	1,500—3,000
158.	Garuga pinnata, Roxb.	3	2,000—3,500
159.	Commiphora berryi, Engl.	1	450—2,000
160.	Protium caudatum, W. & A.	3	1,000—4,000
161.	Canarium strictum, Roxb.	3	4,000—5,000
	30. *Meliaceæ.*		
162.	Munronia wallichii, W.	5	3,900
163.	Azadirachta indica, Juss.	3. 5. 10	450—3,000
164.	Melia dubia, Cav.	......	3,000—3,600
165.	Cipadessa fruticosa, Blume	4. 11	2,000—4,000
166.	Cedrela microcarpa, C. D. C.	2— 3	4,000—5,300
167.	Chloroxylon swietenia, DC.	3— 4	450—3,500
	31. *Olacaceæ.*		
168.	Olax scandens, Roxb.	5	1,100—3,500
169.	Cansjera rheedii, Gmel.	4	3,400
170.	Opilia amentacea, Roxb.	3—4	2,600—4,200
171.	Mappia fœtida, Miers	5—8	4,000—5,200
	32. *Celastraceæ.*		
172.	Euonymus crenulatus, Wall	5. 11	4,800—5,300
173.	Pleurostylia wightii, W. & A.	12	3,700
174.	Celastrus paniculata, Willd.	4—6	2,400—4,000

	——	Flowering time.	Elevation in feet.
	32. *Celastraceæ.*—contd.		
175.	Gymnosporia rothiana, W. & A.	10	3,000—3,500
176.	„ heyneana, W. & A.	8	3,500—4,000
177.	„ montana, Roxb.	11	2,700—3,400
178.	Elæodendron glaucum, Pers.	4—9	1,200—3,400
179.	Hippocratea obtusifolia, Roxb.	3	2,000
180.	Salacia oblonga, Wall.	4	4,000
	33. *Rhamnaceæ.*		
181.	Ventilago madraspatana, Gaertn.	12	2,400—3,500
182.	Zizyphus jujuba, Lamk.	7—10	1,000—2,200
183.	„ trinervia, Roxb.	4	700—2,200
184.	„ œnoplia, Mill.	8—10	650—4,000
185.	„ xylopyrus, Willd.	4	2,000—4,000
186.	„ rugosa, Lamk.	3—4. 12	2,000—5,000
187.	Rhamnus dahuricus, Pall.	5	5,000
188.	Scutia indica, Brongn.	3—5	1,200—4,000
189.	Sageretia hamosa, Brongn.	11—12	3,600—4,000
190.	„ oppositifolia, Brongn.	3	4,000—4,300
	34. *Vitaceæ.*		
191.	Vitis quadrangularis, Wall.	5	500—2,200
192.	„ repens, W. & A.	4	3,400
193.	„ woodrowii, Stapf.	4—5	3,000—3,600
194.	„ pallida, W. & A.	5	3,000—3,700
195.	„ repanda, W. & A.	4	2,000—3,000
196.	„ linnæi, Wall.	8	2,000
197.	„ tomentosa, Heyne	8	2,000—3,500
198.	„ setosa, Wall.	9	1,000—1,500
199.	„ carnosa, Wall.	12	1,200—2,400
200.	„ auriculata, Roxb.	4	3,000—3,600
201.	„ pedata, Vahl.	4—10	3,000—3,700
202.	Leea aspera, Wall.	5—8	3,000—4,000
203.	„ sambucina, Willd.	5	4,000
	35. *Sapindaceæ.*		
204.	Cardiospermum halicacabum, L.	5—1	1,000—2,500
205.	„ canescens, Wall.	4—10	1,000—3,500
206.	Hemigyrosa canescens, Thw.	3	1,000
207.	Allophylus cobbe, Blume. var serratus	5—10	1,000—2,000
	„ „ var. distachys	8	5,000
	„ „ var. glaber	8	4,000
	„ „ var. villosus	9	5,000
208.	Sapindus laurifolius, Vahl. var. emarginatus	10	800—2,000
209.	Dodonæa viscosa, L.	4—7	500—5,000
	36. *Sabiaceæ.*		
210.	Meliosma wightii, Planch.	8	4,800—5,800
211.	„ arnottiana, W.	4—5	4,500—5,500

	——	Flowering time.	Elevation in feet.
	37. *Anacardiaceæ.*		
212.	Rhus mysorensis, Heyne	10—11	1,800—2 800
213.	Mangifera indica, L.	1—2	450—4,000
214.	Buchanania lanzan, Spreng.	4	2,000—4,200
215.	" angustifolia, Roxb.	4—6	2,000—3,000
	38. *Leguminosæ.*		
	a. Papilionaceæ.		
216.	Rothia trifoliata, Pers.	7—12	1,200—2,200
217.	Crotalaria biflora, L.	9—11	450—3,400
218.	" globulosa, W.	1	700
219.	" vestita, Baker	11	5,000
220.	" evolvuloides, W.	11 12	2,300—3,700
221.	" rubiginosa, Willd.	6—11	3,600
	" " var. scabrella	8	5,000
	" " var. wightiana	11	3,600
222.	" mysorensis, Roth	8—11	2,300—4,100
223.	" nana, Burm	11—12	5,000—5,500
224.	" tecta, Roth	11	3,000
225.	" linifolia, L.	6. 12	3,000—4,000
226.	" calycina, Schrank.	6. 9—10	3,000—4,200
227.	" chinensis, L.	12	2,800
228.	" priestleyoides, Benth.	11	5,200
229.	" peduncularis, Grah.	11	4 800—5,200
230.	" retusa, L.	10—1	600—3,200
231.	" sericea, Retz.	9	5,200
232.	" lanata, Bedd.	11	4,000
233.	" verrucosa, L.	7—11	900—2,000
234.	" semperflorens, Vent.	11	above 5000 wild
235.	" juncea, L.	9—11	3,000—4,200
236.	" madurensis, W.	2	5,000
237.	" subperfoliata, W.	11	3,700
238.	" fulva, Roxb	10—1	600—2,500
239.	" ramosissima, Roxb.	4	1 000
240.	" medicaginea, Lamk.	11	3,200
	" " var. neglecta	1	1 900
241.	" willdenoviana DC.	10—1	400—1,400
242.	" notonii, W. &. A.	11—12	650—2 500
243.	" orixensis, Rottl.	1	650
244.	" lævigata, Lamk.	11	4,000—5,000
245.	" quinquefolia, L.	11—12	2 000
246.	Indigofera linifolia, Retz.	10—11	2 000
247.	" cordifolia, Heyne	10—11	2,000
248.	" enneaphylla, L.	5—10	800—1,400
249.	" uniflora, Hamilt.	10	600—900
250.	" glabra, L.	11	900
251.	" viscosa, Lamk.	8—11	3 500—3 800
252.	" trifoliata, L.	4—10	2 600—5,000
253.	" vestita, Baker	11	3,400—5,000
254.	" trita, L.	1. 6. 10	600—2,000

	———	Flowering time.	Elevation in feet.
	38. *Leguminosæ.*—contd.		
	a. Papilionaceæ.—*contd.*		
255.	Indigofera subulata, Vahl.	10— 2	1,000—1,200
256.	„ parviflora, Heyne	11— 2	3,500—4,000
257.	„ endecaphylla, Jacq.	9	4,000
258.	„ hirsuta, L.	9	2,500
259.	„ houer, Forsk.	11—12	2,000
260.	„ tenuifolia, Rottl.	5	1,200
261.	„ pedicellata, W. & A.	11	3,400
262.	„ wightii Grah.	7—11	1,200—1,400
263.	„ tinctoria, L.	11	900
264.	„ pulchella, Roxb.	4. 10	3,000—4,500
265.	Psoralea corylifolia, L.	1	900
266.	Mundulea suberosa, Benth.	6—10	400—2,700
267.	Tephrosia calophylla, Bedd.	6	2,800
268.	„ senticosa, Pers.	11	3,000
269.	„ tinctoria, Pers. var. intermedia, W. & A.	9—11	3,200—4,200
270.	„ purpurea, Pers.	3—4. 10	2,000—4,000
271.	„ villosa, Pers.	3—10	1,200—3,000
272.	„ pauciflora, Grah.?	11	3,600
273.	Sesbania ægyptiaca, Pers.	10	350
274.	„ aculeata, Pers.	11	1,500—2,000
275.	Zornia diphylla, Pers.	7—12	1,200—4,400
276.	Pseudarthria viscida, W. & A.	11— 1	600—3,400
277.	Uraria hamosa, Wall.	11	3,500
278.	Desmodium pulchellum, Benth.	10—12	4,000
279.	„ laxiflorum, DC.	10	2,600—4,000
280.	„ scalpe, DC.	9— 2	4,000—5,500
281.	„ gangeticum, DC.	1	600
	„ „ var. maculatum	4	2,500
282.	„ latifolium, DC.	10	3,000—4,000
283.	„ rufescens, DC.	3—5. 11	4,000—5,200
284.	„ polycarpum, DC. var. trichocaulon.	10—11	4,000
285.	„ parviflorum, Baker	11	5,000
286.	„ triflorum, DC.	10—11	650—3,600
287.	„ gyrans, DC.	11	3,600—4,800
288.	Stylosanthes mucronata, Willd.	6	2,800
289.	Smithia gracilis, Benth.	8	5,500
290.	„ pycnantha, Benth.	11	5,000
291.	„ hirsuta, Dalz.	11	5,300
292.	Aeschyonmene indica, L.	11	3,000—4,000
293.	Pycnospora hedysaroides, R. Br.	6—11	3,400—5,400
294.	Alysicarpus monilifer, DC.	7—10	2,000
295.	„ longifolia, W. &. A.	11	3,500
296.	„ hamosus, Edgew.	12	1,000
	„ rugosus, DC.	11	2,000—3,400
297.	„ „ var. styracifolius	7	2,000—3,400
298.	Shuteria vestita, W. &. A.	12	3,400—5,000
299.	Dumasia villosa, DC.	11	5,000
300.	Glycine javanica, L.	11— 1	1,200—3,800

	———	Flowering time.	Elevation in feet.
	Leguminosæ—contd.		
	a. Papilionaceæ—*contd.*		
301.	Teramnus labialis, Spreng.	11	1,200—3,000
302.	Mucuna atropurpurea, DC.	12	3,800
303.	Erythrina indica, L.	2	1,200—1,400
304.	„ suberosa, Roxb.	5—8	2,000
305.	Galactia tenuifolia, W. & A. var. lucida	10	3,300
	„ „ var. latifolia	11	4,900
306.	Butea frondosa, Roxb.	2— 3	2,000—3,000
307.	Canavalia stocksii, DC.	10—11	1,000—2,000
308.	Pueraria tuberosa, DC.	4	3,500—4,000
309.	Phaseolus semierectus, L.	12	3,300
310.	„ trilobus, Ait.	10—12	400—2,500
311.	„ aconitifolius, Jacq.	12	600—2,000
312.	„ sublobatus, Roxb.	10—11	600—5,000
313.	Clitoria ternatea, L.	5—10	900—3,000
314.	Dolichos falcatus, Klein	5	5,000
315.	Atylosia crassa, Prain	11	3,000—3,500
316.	„ rugosa, W. & A.	11	5,000—5,500
317.	Dunbaria ferruginea, W. & A.	11	3,000—3,600
318.	Rhynchosia rufescens, DC.	10	4,000
319.	„ aurea, DC.	11	1,500—2,000
320.	„ suaveolens, DC.	12	2,500—4,000
321.	„ cana, DC.	12	2,800—3,600
322.	„ minima, DC.	1— 3	900—2,200
323.	„ beddomei, Baker ?	11	4,100
324.	„ viscosa, DC.	12	4,000
325.	„ densiflora, DC.	12	4,000
326.	Flemingia grahamiana, W. & A.	3. 11.	3,500—5,000
327.	„ congesta, Roxb. var. semialata	11	4,000
328.	„ nilgiriensis, W.	11	5,000—5,400
329.	Dalbergia latifolia, Roxb.	8	3,000—4,500
330.	„ rubiginosa, Roxb.	3	3,700
331.	„ paniculata, Roxb.	4— 6	1,300—3,600
332.	Pterospermum marsupium, Roxb.	4— 6	2,500—4,500
333.	Pongamia glabra, Vent.	3. 11	1,000—3,000
334.	Sophora glauca, Lesch.	4— 6	3,500—4,800
335.	Calpurnea aurea, Baker	8—11	3,800
	b. Cæsalpineæ.		
336.	Cæsalpinia bonducella, Flem.	6—12	1,000—3,000
337.	„ sepiaria, Roxb.	9—12	2,000 –5,000
338.	„ mimosoides, Lam.	12— 4	2,600—4,000
339.	Pterolobium indicum, A. Rich.	4—10	1,000—3,500
340.	Parkinsonia aculeata, L.	4	1,000—2,000
341.	Cassia fistula, L.	6— 9	1,000—4,200
342.	„ occidentalis, L.	4—10	2,000—3,500
343.	„ tora, L.	8—10	1,000—4,000
344.	„ bicapsularis, L.	5	3,000—4,000
345.	„ auriculata, L.	11— 4	400—2,500
346.	„ obtusa, Roxb.	5— 7	600—2,000

	——	Flowering time.	Elevation in feet.
	Leguminosæ—contd.		
	b. Cæsalpineæ—*concld.*		
347.	Cassia siamea, Lam. (planted)	7	1,000—1,400
348.	„ montana, Heyne	7—10	1,000—2,500
349.	„ glauca, Lam.	7— 8	2,000—4,000
	„ „ var. suffruticosa	8	2,500
350.	„ absus, L.	7	2,000
351.	„ pumila, Lam.	7— 8	2,000
352.	„ mimosoides, L.	9	4,000—5,400
353.	Hardwickia binata, Roxb.	8	1,000—3,000
354.	Tamarindus indica, L.	4— 7	400—3,000
355.	Bauhinia tomentosa, L.	6. 11	900—3,000
356.	„ racemosa, L.	3— 4	450—3,600
357.	„ variegata, L.	8	3,800
	c. Mimoseæ.		
358.	Neptunia oleracea, Lour.	12	2,000
359.	Dichrostachys cinerea, W. & A.	6. 10—11	400—3,000
360.	Mimosa pudica, L.	10—12	3,000—4,000
361.	„ rubicaulis, L.	8—12	3,000—4,000
362.	Acacia farnesiana, Willd. (planted)	7 9	1,200—2,500
363.	„ suma Kurz.	4— 8	450—3,400
364.	„ arabica, Willd.	7	600—2 000
365.	„ leucophlæa, Willd.	8—11	400—4,000
366.	„ sundra, DC.	5	1,000—2,500
367.	„ ferruginea, DC.	3	1,000
368.	„ latronum, Willd.	4. 10	400—2,500
369.	„ concinna, DC.	3— 4	3,500—4,500
370.	„ intsia, Willd.	6— 8	2,000—4,000
371.	Albizzia lebbeck, Benth.	3	600—3,500
372.	„ odoratissima, Benth.	3— 4	3,000—4,000
373.	„ stipulata, Boiv.	4	4,000
374.	„ amara, Boiv.	3— 4	500—4,000
375.	Pithecolobium dulce, Benth	1	1,000—2,000
	39. *Rosaceæ.*		
376.	Rubus moluccanus, L.	8	5,000—55,000
377.	„ ellipticus, Smith	5	4,000—5,500
378.	„ lasiocarpus, Smith	5	3,500—5,000
	40. *Saxifragaceæ.*		
379.	Vahlia viscosa, Roxb.	1	600
380.	Parnassia mysorensis, Heyne	8	5,500
	41. *Crassulaceæ.*		
381.	Bryophyllum calycinum, Salisb.	8	2,800—4,000
382.	Kalanchoe spathulata, DC.?	4	3,500
383.	„ floribunda, W. & A.	3	2,700—4,000
384.	„ bhidei, T. Cooke	11— 2	3,600—4,800
385.	„ laciniata, DC.	5. 12— 1	3,400—4,000

	——	Flowering time.	Elevation in feet.
	42. *Droseraceæ.*		
386.	Drosera peltata, Sm.		5,000—5,500
	43. *Haloragidaceæ.*		
387.	Myriophyllum intermedium, DC.	11— 2	4,000—5,000
	44. *Combretaceæ.*		
388.	Terminalia belerica, Roxb.	4	2,300—4,000
389.	„ chebula, Retz.	3	2,500—4,300
390.	„ arjuna, Bedd.	4	2,000—3,600
391.	„ tomentosa, Bedd.... ...	4	2,000—4,000
	„ „ varr. crenulata ...	4	3,700
392.	„ paniculata, Roth.	8—11	3,000—4,000
393.	Anogeissus latifolia, Wall.	3	600—4,000
394.	Combretum ovalifolium, Roxb.	3	1,000—2,000
395.	Gyrocarpus americanus, Jacq.	1	600—2,000
	45. *Myrtaceæ.*		
396.	Eugenia spicata, Lam.	4	4,500
397.	„ gardneri, Thw.	3	5,000—5,400
398.	„ jambolana, Lam.	4	1,000—4,000
399.	Careya arborea, Roxb.	3	3,000—3,600
	46. *Melastomaceæ.*		
400.	Osbeckia cupularis, Don.	11	5,500
401.	Memecylon angustifolium, W.?	4— 6	2,000—3,000
402.	„ umbellatum, Burm., var. ramiflora.	4— 6	2,800—4,200
	47. *Lythraceæ.*		
403.	Ammannia pentandra, Roxb.	12— 1	700—2,000
	„ „ var. illecebroides, Arn.	11	4,000—5,000
404.	„ baccifera, L.	10—11	1,200—4,000
405.	„ salicifolia, Monti.	11	700—3,600
406.	„ multiflora, Roxb.	12— 1	700—2,000
407.	Lawsonia inermis, L. (run wild)	8	1,400
	48. *Onagraceæ.*		
408.	Fussiæa repens, L.	4. 12	2,000—3,000
409.	„ suffruticosa, L.	5. 10	2,400—4,000
410.	Ludwigia parviflora, Roxb.	1. 8—10	450—2,000
	49. *Samydaceæ.*		
411.	Cæsaria tomentosa, Roxb.	12—1	2,400

———	Flowering time.	Elevation in feet.
50. *Passifloraceæ.*		
412. Passiflora adenophylla, Mast.	7—9	1,400—4,200
413. „ fœtida, L.	2	1,000
51. *Cucurbitaceæ.*		
414. Trichosanthes palmata, Roxb.	3. 8	800—3,600
415. „ cucumerina, L.	2—3	5,000—5,500
416. „ lobata, Roxb.	11	4,000
417. Lagenaria vulgaris, Seringe (run wild)	12— 2	2,000— 4,000
418. Luffa ægyptiaca, Mill.	10	1,200
419. „ acutangula, Roxb. var. amara	10—12	1,000—4,000
420. Momordica charantia, L.	1. 10	900—1,000
421. „ dioica, Roxb.	8	2,500 – 5,300
422. Cucumis trigonus, Roxb.	7—10	650—2,000
423. Citrullus vulgaris, Schrad. (run wild)	7—10	600—1,000
424. Coccinea indica, W. & A.	5. 10	800—3,600
425. Bryonia laciniosa, L.	8—12	1,000—4,200
426. Melothria perpusilla, Cogniaux	6—10	1,200—4,000
427. „ madaraspatana, Cogniaux	4—10	3,000—3,500
428. „ heterophylla, Cogniaux	3— 8	2,500—5,000
429. Kedrostis rostrata, Cogniaux	10	1,100
430. Corallocarpus epigæa, H. f.	4	1,400—3,500
431. Blastania garcini, Cogniaux	1. 8	800—1,500
52. *Begoniaceæ.*		
432. Begonia malabarica, Lam.	3— 4	3,400—5,000
53. *Cactaceæ.*		
433. Opuntia dillenii, Haw. (run wild)	1—12	400—4,000
54. *Ficoideæ.*		
434. Trianthema monogyna, L.	5. 10	650—1,400
435. „ decandra, L.	7—12	1,200—3,500
436. Orygia decumbens, Forsk.	7—10	450—2,000
437. Mollugo hirta, Thunb.	4—5. 10	450—3,500
438. „ oppositifolia, L.	7—10	450—2,000
439. „ pentaphylla, L.	5. 12	1,200—3,600
440. „ cerviana, Seringe	6	2,000—3,000
441. Gisekia pharnaceoides, L.	6. 10	600—2,000
55. *Umbelliferæ.*		
442. Hydrocotyle polycephala, W.	5—8	5,000
443. „ asiatica, L.	11— 1	600—1,600
444. Bupleurum virgatum, W. & A.	12	3,700
445. Pimpinella monoica, Dalz.	8—12	3,600—4,200
446. Polyzygus tuberosus, Dalz.	2	4,100
447. Coriandrum sativum, L. (run wild)	12	2,000—3,000

	———	Flowering time.	Elevation in feet.
	56. *Araliaceæ.*		
448.	Heptapleurum racemosum, Bedd.	4—5	5,000—5,400
449.	„ venulosum, Seem	4—5	3,500—5,000
	57. *Caprifoliaceæ.*		
450.	Viburnum punctatum, Ham.	8—11	4,000—5,000
451.	„ coriaceum, Blume.	8—12	3,700—5,000
452.	Lonicera leschenaultii, Wall.	6—11	3,700—4,200
	58. *Rubiaceæ.*		
453.	Mytragyna parvifolia, Korth.	4. 12	2,800—4,000
454.	Wendlandia notoniana, Wall.	3	3,400—4,500
455.	Dentella repens, Forst.	1. 9	600—1,500
456.	Hedyotis pinifolia, Wall.	2. 5. 11	800—5,000
457.	Oldenlandia corymbosa, L.	6—11	650—4,000
458.	„ herbacea, Roxb.	7—11	1,300—3,800
459.	„ umbellata, L.	7	1,200—1,400
460.	„ wightii, H. f.	5— 7	900—1,400
461.	„ dichotoma, Koen.	10	3,400
462.	„ aspera, DC.	7—10	600—2,000
463.	Oldenlandia paniculata, L.	9—11	1,300
464.	Anotis quadrilocularis, H. f.	11	5,200
465.	Ophiorrhiza mungos, L.	8	5,000
466.	Tarenna zeylonica, Gaertn.	4—6	1,200—3,500
467.	Randia dumetorum, Lam.	4—7	600—4,000
468.	„ malabarica, Lam.	4—6	2,800—4,200
469.	„ candolleana, W. & A.	4—6	2,600—3,400
470.	Gardenia gummifera, L.	3—6	2,800—4,200
471.	„ latifolia, Ait.	6	2,800
472.	Knoxia corymbosa, Willd.	4. 8	3,500—4,000
473.	„ mollis, W. & A. (?)	5	3,600
474.	„ wightianna, Kurz Wall.	5	4,000
475.	Plectronia didyma Brand.	6—11	2,600—4,000
476.	„ wightii, T. Cooke	2	3,700—5,000
477.	„ parviflora, Bedd.	4—10	400—3,800
478.	Vangueria spinosa, Roxb.	3	3,400—4,000
479.	Ixora elongata, Heyne	3—5	5,000—5,500
480.	„ parviflora, Vahl	3—4	2,500—3,500
481.	Pavetta indica, L.	4—5	1,200—5,000
	„ „ var. tomentosa, Roxb.	4—5. 10	3,400—4,000
482.	Coffea wightiana, W. & A.	3—5	1,000
483.	Morinda citrifolia, L.	4	2,500—3,000
484.	„ tinctoria, Roxb.	4	3,500
485.	„ umbellata, L.	4—9	3,000—4,200
486.	Psychotria truncata, Wall.	3	5,000—5,400
487.	„ elongata, W.	3	5,000—5,400
488.	„ bisulcata, W. & A.	9	4,000—4,200
489.	Lasianthus ciliatus, W.	5	5,000—5,300
490.	Spermacoce ocymoides, Burm (?)	9—10	3,500—5,000
491.	„ stricta, L.	8	3,800
492.	„ hispida, L.	8	3,800
493.	Rubia cordifolia, L.	8—12	5,000—5,300

	———	Flowering time.	Elevation in feet.
	59. *Compositæ.*		
494.	Vernonia cinerea, Less.	1—12	600—3,000
495.	„ anthelmintica, Willd.	10—11	2,000—4,000
496.	„ cinerascens, Sch.	7	1,000—2,500
497.	„ indica, Clarke	3. 9—11	3,000—5,000
498.	„ arborea, Ham.	3—4	4,000—5,700
499.	Elephantopus scaber, L.	9	3,600—4,000
500.	Adenostemma viscosum, Forst.	11—12	4,000—5,000
501.	Ageratum conyzoides, L.	4—5	3,300—5,700
502.	Dichrocephala latifolia, DC.	7—9	1,400—5,000
503.	Grangea madaraspatana, Poir.	7—12	2,000—2,800
504.	Cyathocline lutea, Law.	1	700
505.	Erigeron asteroides, Roxb.	3. 7—9	1,200—2,200
506.	Conyza stricta, Willd.	10—11	3,500—4,200
507.	„ rufa, Wall.	8	4,000
508.	Blumea trifoliata, DC. (?)	9	1,200
509	„ wightiana, DC.	10	400—1,300
510	„ lacera, DC. var. glandulosa	12	2,600
511	„ membranacea, DC.	12	3,400
512·	„ eriantha, DC.	1	900
513	„ spectabilis, DC.	2—3	4,500—5,200
514·	Laggera alata, Schultz	12—2	3,700—5,000
515·	„ pterodonta, Benth.	2	2,500—4,000
516·	Pluchea tomentosa, DC.	9	1,200
517·	Epaltes divaricata, Cass.	1	700
518·	Sphæranthus indicus, L.	12—4	2,000—3,000
519·	Blepharispermum subsessile, DC.	8—12	2,000—4,000
520·	Anaphalis oblonga, DC.	8—11	5,000
521·	Helichrysum buddleioides, DC.	2	5,500
522·	Gnaphalium indicum, L.	9—12	2,500—3,500
523·	Vicoa auriculata, Cass.	3—5. 10	600—2,000
524·	„ vestita, Benth.	8	2,000
525·	Pulicaria foliosa, DC.	1	600—800
526·	„ wightiana, Clarke	1	800—1,400
527·	Lagasca mollis, Cav.	11	6,200
528·	Siegesbeckia orientalis, L.	6—12	3,600—1,500
529·	Eclipta alba, Hassk.	5. 10	1,200—5,000
530·	Blainvillea rhomboidea, Cass.	5—10	900—4 200
531·	Wedelia calendulacea, Less.	10	1,200
532·	„ urticæfolia, DC.	4. 9	4,000—5,000
533·	Spilanthes acmella, L.	2. 9	4,000—5,000
534·	Glossocardia linearifolia Cass.	1. 7—10	700 2,000
535·	Bidens pilosa, L.	5. 11	3,500—4,700
	„ „ var. bipinnata	4	3,500
536.	Glossogyne pinnatifida, DC. (run wild)	8	3,600—5,000
537.	Galinsoga parviflora, Cav.	1. 6—7	600—4,000
538.	Tridax procumbens, L.	1—12	500—3,000
539.	Chrysanthellum indicum, DC.	5—8	5,000
540.	Artemisia parviflora, Roxb.	3. 11	3,500—5,000
541.	Gynura nitida, DC.	10—12	3,500—5,000
542.	Emilia sonchifolia, DC.	11—1. 6	3,900—5,500
543.	Notonia grandiflora, DC.	4—12	1,300—4,200
544.	Senecio dalzellii, Clarke	3	5,400

	——	Flowering time.	Elevation in feet.
	Compositæ.—contd.		
545.	Senecio tenuifolius, Burm.	9—12	3,800—5,200
546.	„ edgeworthii, H. f.	11	5,400
547.	„ candicans, DC.	11—2	3,800
548.	„ scandens, Don.	2	5,030
549.	„ corymbosus, Wall.	2	5,000—5,700
550.	Tagetes erecta, L. (run wild)	9	5,000
551.	Flaveria contrayerba, Pers.	11—2	1,300—2,000
552.	Echinops echinatus, DC.	11—3	2,000
553.	Cnicus involucratus, DC. (run wild)	6	4,800
554.	Tricholepis radicans, DC.	11—12	2,400—3,500
555.	Volutarella divaricata, Benth.	9—12	1,200—4,200
556.	Dicoma tomentosa, Cass.	10—1	400—2,000
557.	Crepis japonica, Benth.	11	4,800
558.	„ acaulis, H. f.	3—5. 11	4,000—6,000
559.	Lactuca runcinata, DC.	11—1	1,200—2,400
560.	„ remotiflora, DC.	1	850
561.	Sonchus oleraceus, L.	3. 9	1,200—4,000
562.	„ arvensis, L.	6. 9—11	2,700—4,000
563.	Launæa aspleniifolia, DC.	7	1,300
564.	„ nudicaulis, Less.	11	2,100
	60. *Campanulaceæ.*		
565.	Lobelia trigona, Roxb.	11—3	3,500—4,000
566.	„ affinis, Wall.	5	4,000
567.	„ trialata, Ham. var. lamiifolia	11	4,000
568.	„ nicotianæfolia, Heyne	11—3	5,000—5,800
	„ „ var. trichandra	2—3	4,800—5,300
569.	Cephalostigma schimperi, Hochst.	11—12	3,400—5,000
570.	„ flexuosum, H. f.	11	3,500—5,500
571.	Campanula fulgens, Wall.	11	5,200
	61. *Plumbaginaceæ.*		
572.	Plumbago zeylanica, L.	3—6	2,000—4,000
	62. *Primulaceæ.*		
573.	Anagallis arvensis, L.	9—12	3,500—4,200
574.	Centunculus tenellus, Duby	11	4,000—5,000
	63. *Myrsinaceæ.*		
575.	Mæsa indica, Wall.	9—3	3,800—5,200
576.	Embelia ribes, Burm.	4	4,800
577.	„ viridiflora, Scheff.	2. 6. 9	3,700—4,000
578.	Ardisia pauciflora, Heyne	5	5,200
579.	„ solanacea, Roxb.	4—5	3,500—4,200
	64. *Sapotaceæ.*		
580.	Sideroxylon tomentosum, Roxb.	5	5,000—5,700

	——	Flowering time.	Elevation in feet.
	64. *Sapotaceæ.*—contd.		
581.	Isonandra candolliana, W.	5	5,000—5,300
582.	Bassia latifolia, Roxb.	4	2,600—3,200
583.	Mimusops elengi, L.	4	2,800
584.	„ hexandra, Roxb.	4	2,700
	65. *Ebenaceæ.*		
585.	Maba buxifolia, Pers.	4	2,700
586.	Diospyros montana, Roxb.	3	600—3,400
587.	„ cordifolia, Roxb.	......	3,800
588.	„ ovalifolia, W.	6	3,600
589.	„ microphylla, Bedd.	5	3,400
590.	„ melanoxylon, Roxb.	4	2,800
	66. *Styracaceæ.*		
591.	Symplocos spicata, Roxb.	3. 8	4,800—5,200
	67. *Oleaceæ.*		
592.	Jasminum sambac, Ait.	1	1,100
593.	„ pubescens, Willd.	3	5,200
594.	„ ritchiei, Clarke	10	2,400—3,000
595.	„ wightii, Clarke	6	1,000
596.	„ rigidum, Zenk.	10—12, 4	1,000—3,400
597.	„ trichotomum, Heyne	6	1,500—2,700
598.	„ auriculatum, Vahl.	4, 9	650—3,500
599.	„ flexile, Vahl.	2	3,600—4,000
600.	Olea glandulifera, Wall.	5—6	4,200—5,200
601.	„ dioica, Roxb.	3—4	4,000—5,200
602.	Ligustrum robustum, Blume	5	5,000
603.	„ roxburghii, Clarke	5—8	3,400—4,000
604.	„ neilgerrense, Clarke	8	4,000
	„ „ var. obovata	12	3,800
	68. *Salvadoraceæ.*		
605.	Salvadora persica, L.	1	800—2,000
606.	Azima tetracantha, Lam.	4	800—1,500
	69. *Apocynaceæ.*		
607.	Carissa carandas, L.	2—6	1,000—3,500
608.	„ spinarum, A. DC.	3—4	3,300—4,200
	„ „ var. hirsuta	3—5	3,000—4,300
609.	Thevetia neriifolia, Juss. (run wild)	4—6	2,400—3,500
610.	Lochnera pusilla, K. Schum.	6—10	450—2,700
611.	„ rosea, Reichb. (run wild)	1—12	1,000—3,500
612.	Plumeria acutifolia, Poir. (run wild)	1—12	1,000—3,500
613.	Alstonia venenata, R. Br.	4	4,800
614.	Vallaria heynei, Spreng.	4	2,700
615.	Wrightia tinctoria, R. Br.	4	600—3,400

	———	Flowering time.	Elevation in feet.
	69. *Apocynanceæ.*—contd.		
616.	Nerium odorum, Soland. (run wild)	4—8	1,400—3,400
617.	Ichnocarpus frutescens, Ait	4. 9—12	1,000—4,200
	70. *Asclepiadaceæ.*		
618.	Hemidesmus indicus, R. Br.	10—11	2,400—3,500
619.	Cryptolepis buchanani, Rœm. & Sch. ...	4. 12	3,400—4,000
620.	„ grandiflora, W.	9—11	1,000—2,500
621.	Cryptostegia grandiflora, R. Br. (run wild) ...	1. 9	1,200—1,600
622.	Holostemma rheedianum, Spreng.	8—11	3,000—3,800
623.	Decalepis hamiltonii, W. & A.	4— 6	2,500—3,590
624.	Secamone emetica, Br.	4— 7	2,000—3,500
625.	Oxystelma esculentum, Br.	7— 9	1,200—1,300
626.	Calotropis gigantea, Br.	1—12	400—3,500
627.	Pentatropis microphylla, W. & A.	10—11	1,200—2,200
628.	Dæmia extensa, Br.	4	1,000—3,000
629.	Cynanchum callialota, Ham.	8—11	3,500—4,000
630.	Sarcostemma brevistigma, W. & A.	4— 5	1,200
631.	„ brunonianum, W. & A. ..	5— 8	3,400
632.	„ intermedium, Decais.	7—11	1,000—3,600
633.	Gymnema sylvestris, Br.	8—11	1,000—4,000
634.	Tylophora fasciculata, Ham. ...	5	3,600
635.	„ macrantha, H. f.	6	2,800
636.	„ dalzellii, H. f.	10	1,000—3,500
637.	„ asthmatica, W. & A.	3 7	600—2,000
638.	Dregea volubilis, Benth, ...	4— 6	1,300—4,000
639.	Hoya wightii, H. f.	3	5,600
640.	Leptodenia reticulata, W. & A.	5	600—1,000
641.	Brachystelma maculatum, H. f.	6	3,900
642.	Ceropegia juncea, Roxb.	10—11. 4	1,200—3,000
643.	„ mysorensis, W.	12	4,000
644.	„ elegans, Wall.	10—12	2,000—3,500
645.	„ tuberosa, Roxb.	5—12	3,000—4,000
646.	„ oculata, Hook. (?)	11	2,600
647.	Caralluma adscendens, Br.	7	1,200—1,400
648.	„ fimbriata, Wall.	1. 10	600—1,000
649.	Boucerosia crenulata, W. & A.	3— 8	1,000—4,000
	71. *Loganiaceæ.*		
650.	Buddleia asiatica, Lour.	9	4,200
651.	Fagræa obovata, Wall.	5	5,000—5,300
652.	Strychnos nux-vomica, L.	3	900—2,400
653.	Gardneria ovata, Wall.	5	5,100
	72. *Gentianaceæ.*		
654.	Exacum perottetii, Griesb.	11	3,600—4,000
655.	„ bicolor, Roxb	8—11	4,000—5,500
656.	„ pedunculatum, L.	9	400— 500
657.	Enicostemma littorale, Blume	6—11	800—2,700
658.	Canscora diffusa, R. Br.	1	650

	——	Flowering time.	Elevation in feet.
	72. *Gentianaceæ.*—contd.		
659.	Canscora pauciflora, Dalz.	11	2,300
660.	,, decussata, Rœm. & Sch.	11—12	2,300—4,000
661.	Swertia affinis, Clarke	8—12	4,000—5,200
662.	,, corymbosa, W., var. lawii, C. B. C.	11—12	3,800—4,000
663.	,, decussata, Nim.	11	5,400
664.	Limnanthemum cristatum, Griesb.	......	......
	73. *Boraginaceæ.*		
665.	Cordia myxa, L.	3	1,100
666.	,, wallichii, G. Don.	3	2,400—3,500
667.	,, fulvosa, W.	4— 7	1,500—3,600
668.	Ehretia lævis, Rox.	8—10	650—2,400
669.	,, aspera, Roxb.	7—10	1,000—2,000
670.	,, wightiana, Wall.	11	1,000—3,600
671.	,, buxifolia, Roxb.	4. 9—12	1,200—4,000
672.	Coldenia procumbens, L.	7	1,200—2,000
673.	Heliotropium zeylanicum, Lam.	10—11	1,300
674.	,, supinum, L.	9— 1	1,200—2,000
675.	,, ovalifolium, Forsk.	5—10	800—2,000
676.	,, rottleri, Lehm.	5—10	1,200—1,400
677.	,, paniculatum, Br.	8—10	600—2,000
678.	,, strigosum, Willd.	5	1,200
679.	,, bracteatum, DC.	5	800—1,000
680.	,, marifolium, Retz. var., wallichii	10	850
681.	,, indicum, L.	4. 10	800—3,400
682.	,, scabrum, Retz.	7—12	1,200—4,000
683.	Trichodesma indicum, Br.	4. 12	2,000—3,500
684.	,, zeylanicum, Br.	9—12	900—4,200
685.	Cynoglossum furcatum, Wall.	4—12	3,500—5,000
686.	,, ,, var. lanceolata	5	4,000
687.	,, denticulatum, A., DC., var. zeylanica.	6	2,700
	74. *Convolvulaceæ.*		
688.	Rivea hypocrateriformis, Chois.	10—1	400—1,200
689.	Argyreia bracteata, Chois.	10	3,000
690.	,, pomacea, Chois.	8	3,800
691.	,, lawii, Clarke [?]	4	4,000
692.	,, cuneata, Ker.	4. 8—10	2,000—4,000
693.	Lettsomia aggregata, Roxb.	11—12	2,400
694.	,, elliptica, W.	2. 12	2,400—4,000
695.	,, setosa, Roxb.	11	4,000
696.	Ipomæa quamoclit, L. [run wild]	11—2	3,800
697.	,, nil, Roth.	10—2	2,000—2,500
698.	,, pes-tigridis, L.	10—12	650—3,000
699.	,, eriocarpa, Br.	11	3,400—3,800
700.	,, obscura, Ker.	4. 11	2,000—4,000
701.	,, sepiaria, Koen., var. stipulacea	1. 5	800—1,200
702.	,, beladamboe, Rœm. & Sch.	12—4	2,000
703.	,, aquatica, Forsk.	11—1	1,200

		Flowering time.	Elevation in feet.
	74. *Convolvulaceæ.*—contd.		
704.	Ipomœa staphylina, Rœm. & Sch	11—1	1,200—4,000
705.	" campanulata, L.	3	900—2 900
706.	" pilosa, Sweet...	10	2,000
707.	" quinata, Br.	10	2,200
708.	" palmata, Forsk.	10—11	1,200—2,500
709.	Merremia pentaphylla, Hallier f. (run wild).	11	3,400
710.	" tridentata, Hallier f.	5—8	1 200—2,300
711.	" chryseides, Hallier f. ...	12	700—2,300
712.	" emarginata, Hallier f. ..	12	2,300
713.	Calonyction speciosum, Chois. (run wild)	2	2,300
714.	Operculina turpethum, Manso ...	12	2,800
715.	Convolvulus rottlerianus, Chois.	11—1	650—2,000
716.	" flavus, Willd.	5	5,000
717.	Jacquemontia paniculata, Hallier f.	11—12	2,000—3,000
718.	Evolvulus alsinoides, L.	1—12	800 3,500
	" " var. linifolius ...	12	3,600
	75. *Solanaceæ.*		
719.	Solanum nigrum, L.	8	5,100
720.	" verbascifolium, L. ...	4—5	2,500—3,500
721.	" pubescens, Willd. ...	4—10	600—3,500
722.	" giganteum, Jacq. ...	3—6	4,000—5,000
723.	" wightii, Nees. ...	12	4,400
724.	" torvum, Swartz. ...	5—8	900—4,000
725.	" indicum, L.	5—8	1,200—3,500
726.	" xanthocarpum, Schrad.	1	600
727.	" trilobatum, L. ...	5. 11	1,200—2,200
728.	Physalis minima, L.	10—12	600—3,000
729.	" peruviana, L. (run wild) .	2	5,000—5,500
730.	Withania somnifera, Dunal (run wild)	1	650
731.	Nicandra physaloides, Gaertn. (run wild)	8—11	2,000—5,200
732.	Browallia demissa, L. (run wild) ...	11	5,000—5,700
733.	Datura stramonium, L.	4—5	3,400—4,100
734.	" fastuosa, L., var. alba, Clarke	1—12	1,000—3 000
	76. *Scrophulariaceæ.*		
735.	Calceolaria mexicana, Benth. (run wild)	5—8	5,000—5,700
736.	Celsia coromandeliana, Vahl.... ...	1—3	600—2 000
737.	Sutera glandulosa, Roth	1—4	600—2,000
738.	Stemodia viscosa, Roxb.	1—5	600—1,400
739.	Limnophila hirsuta, Benth.	1	600
740.	" sessiliflora, Blume ...	12	2.000
741.	" gratioloides Br.	11—1	1,000—4,000
742.	Moniera cuneifolia, Mich. ...	1. 4. 8	1,000—3,500
743.	Dopatrium junceum, Buch.-Ham.	10	450
744.	Torenia vagans, Roxb.... ...	1	650
745.	Vandellia hirsuta, Benth. ...	2—3	3,500—4,000
746.	" scabra, Benth. ...	5. 11	4,000

	——	Flowering time.	Elevation in feet.
	76. *Scrophulariaceæ.*—contd.		
747.	Vandellia erecta, Benth.	9	5,000
748.	„ pedunculata, Benth.	11	5,000
749.	Ilysanthes hyssopioides, Benth.	1	700
750.	„ parviflora, Benth.	11—1	650—4,000
751.	Bonnaya veronicæfolia, Spreng.	5	5,000
	„ „ var. verbenæfolia	5	4,000
752.	„ oppositifolia, Spreng.	1	650
753.	„ tenuifolia, Spreng.	1. 10	450—1,300
754.	„ sp. (resembling 753)	11—2	450—1,300
755.	Scoparia dulcis, L.	1. 5—11	600—1,000
756.	Buchnera hispida, Ham.	12	3,200
757.	Striga densiflora, Benth.	1. 6—10	1,000—3,700
758.	„ lutea, Lour.	1. 5—10	1,000—3,600
759.	„ euphrasioides, Benth.	5—4	1,200—4,000
760.	Sopubia delphinifolia, G. Don.	10—11	3,500—4,000
761.	„ trifida, Ham.	8—11	3,000—4,000
762.	Micrargeria wightii, Benth.	2	1,000
763.	Pedicularis zeylanica, Benth.	8	5,000—5,500
	77. *Orobanchaceæ.*		
764.	Æginetia indica, Roxb.	8	3,900
765.	Orobanche cernua, Loeffl., var. desertorum	1—3	1,000—1,400
	78. *Lentibulariaceæ.*		
766.	Utricularia albo-cœrulea, Dalz. (?)	2	5,000
767.	„ arcuata, W.	5	5,000
768.	„ affinis, W.	11	5,500
769.	„ cœrulea, L.	11	5,500
770.	„ reticulata, Smith, var. uliginosa	11	4,300
771.	„ wallichiana, W.	2	4,000
772.	„ striatula, Smith	11	4,800
	79. *Gesneraceæ.*		
773.	Æschynanthus perottetii, A. DC.	8	4,500—5,200
774.	Didymocarpus rottleriana, Wall.	5	3,800—4,000
775.	Klugia notoniana, A. DC.	2—6	4,000—5,000
	80. *Bignoniaceæ.*		
776.	Dolichandrone crispa, Seem.	6—11	2,000—3,000
777.	„ falcata, Seem.	5—7	1,200—2,000
778.	Stereospermum chelonoides, DC.	6	2,500—3,500
779.	Radermachera xylocarpa, K. Schum.	3—4	3,400—4,600
	81. *Pedaliaceæ.*		
780.	Pedalium murex, L.	5. 10	800—1,200
781.	Sesamum indicum, DC. (run wild)	10	600—1,200
782.	Martynia diandra, Glox.	8—10	600—2,400

	——	Flowering time.	Elevation in feet.
	82. *Acanthaceæ*.		
783.	Thunbergia fragrans, Roxb., var. vestita, Nees.	4—10	2,000—4,000
784.	,, hawtayneana, Wall.	5—6	3,000—4,000
785.	Tubiflora acaulis, O. Kuntze	5—8	600—2,000
786.	Hygrophila angustifolia, R. Br.	4	2,000
787.	Asteracantha longifolia, Nees	11—4	1,200—3,400
788.	Calophanes nagchana, Nees	5. 12	2,000—3,600
789.	,, littoralis, T. Anders.	5. 10	500—1,400
790.	,, vagans, W.	12	3,000
791.	Ruellia prostrata, Lam.	1	1,300
792.	,, patula, Jacq.	5—11	1,200—3,200
793.	Dædalacanthus montanus, T. Anders. var. concanensis, T. Anders.	1—2	600—2,500
794.	Strobilanthes kunthianus, T. Anders.	11	5,000—5,800
795.	,, cuspidatus, T. Anders.	11—1	1,200—2,000
796.	,, consanguineus, Clarke	4. 11	3,300—4,000
	,, var. amomum	10	3,500
797.	,, heteromallus, T. Anders.	11	5,000
798.	,, pulneyensis, Clarke	11	4,000
799.	,, heyneanus, Nees	11	5,000
800.	,, luridus, W.	3	5,000—5,300
801.	,, asper, W.	3	5,000—5,300
802.	Blepharis boerhaaviæfolia, Pers.	5—12	1,000—3,000
803.	,, mollugimfolia, Pers.	10—12	900—3,000
804.	Barleria prionitis, L.	1—12	600—2,000
805.	,, cuspidata, Heyne	1	600
806.	,, buxifolia, L.	5. 11	600—2,200
807.	,, mysorensis, Roth	1. 4. 10	700—1,000
808.	,, noctiflora, L. f.	1. 6	600—1,400
809.	,, longiflora, L. f.	10— 1	650—1,500
810.	,, tomentosa, Roth	10—11	1,000—2,000
811.	,, involucrata, Nees. var. elata, C. B. Clarke.	2	4,000
812.	,, lawii, T. Anders.	11— 2	5,000—5,800
813.	,, montana, Nees.	11—12	3,000—3,500
814.	,, grandiflora, Dalz.	10	1,500
815.	,, cristata, L.	11	3,800—4,000
816.	Crossandra undulæfolia, Salisb.	4— 7	1,000—1,400
817.	Asystasia coromandeliana, Nees	5—12	1,200—3,500
818.	,, violacea, Dalz.	6	4,000
819.	Andrographis pomiculata, Nees	12— 2	2,400—3,000
820.	,, wightiana, Arn.	11	3,100
821.	,, lineata, Nees	5	3,600
822.	,, echioides, Nees	6— 7	1,200—2,200
823.	,, rothii, Clarke	1. 9	2,000—4,000
824.	,, serpyllifolia, W.	4. 11	2,000—3,700
825.	Lepidagathis cristata, Willd.	11— 1	1,100—2,400
826.	,, mitis, Dalz.	12	2,100
827.	,, spinosa, W.	10	400—600
828.	,, scariosa, Nees	11	1,000
829.	Justicia betonica, L.	5. 11	600—1,000
830.	,, trinervia, Vahl., var. arenaria	6	2,800

	—	Flowering time.	Elevation in feet.
	82. *Acanthaceæ.*—contd.		
831.	Justicia glauca, Rottler	1—10	600—1,400
832.	„ glabra, Koen.	11—12	1,800—3,000
833.	„ micrantha, Wall.	1. 4. 11	1,000—5,200
834.	„ diffusa, Willd., var. orbiculata	6. 11	1,300—4,000
835.	„ simplex, Don	11	3,900
836.	„ procumbens, L.	8	3,800
837.	Rhinacanthus communis, Nees, var. montana.	12—4	1,500—4,000
838.	Ecbolium linneanum, Kurz	10	600
	„ „ var. rotundifolia	6—10	450—1,400
839.	Rungia parviflora, Nees	3	3,500
840.	Dicliptera zeylanica, Nees	12—2	12,000—3,500
841.	Peristrophe bicalyculata, Nees	11	3,800
	83. *Verbenaceæ.*		
842.	Lantana camara, L.	4	1,400—3,000
843.	„ indica, Roxb.	4	3,000—4,000
	„ „ var. albiflora, W.	5	1,200—4,000
844.	Stachytarpheta indica, Vahl	3—4	2,000—3,500
845.	Lippia nodiflora, Rich.	5—7	600—1,400
846.	Priva leptostachya, Juss.	1—8	700—3,600
847.	Callicarpa lanata, L.	5—8	4,000—5,000
848.	Tectona grandis, L. f.	8	3,000—4,000
849.	Premna tomentosa, Willd.	3—6	2,000—3,500
850.	„ wightiana, Schauer	6	2,000
851.	Gmelina arborea, L.	2—3	3,000—4,000
852.	„ asiatica, L.	4. 10	600—2,000
853.	Vitex negundo, L.	4—9	650—3,600
854.	„ altissima, L. f.	4	2,400—3,600
	„ „ var. alata, Heyne	4—8	2,400—3,600
855.	Clerodendron inerme, Gaertn.	10—12	1,000—2,000
856.	„ phlomoides, L. f.	11—1	650—2,600
857.	„ serratum, Spreng.	4. 10—11	3,400—4,000
858.	„ infortunatum, Gaertn.	4. 8—11	4,000—5,000
	84. *Labiatæ.*		
859.	Ocimum canum, Sims	7—10	650—2,000
860.	„ basilicum, L.	5	600—1,200
	„ „ var. purpurascens, Benth.	9	600—1,200
861.	„ sanctum, L.	6	1,000—2,600
862.	Geniosporum prostratum, Benth	12	3,500
863.	Orthosiphon diffusus, Benth.	5. 12	3,600
864.	„ tomentosus, Benth	4	3,500
	„ „ var. glabrata	5	3,600
865.	Plectranthus rivularis, W.	12—2	3,500—3,800
866.	„ nilghiricus, Benth.	11	5,000
867.	„ coetsa, Ham.	11	4,000
868.	„ incanus, Link.	9—11	4,000—4,500
869.	„ coleoides, Benth.	12—3	5,000
870.	„ fruticosus, W	11	4,000
87g.	Coleus barbatus, Benth	8. 12	3,000—3,500

		Flowering time.	Elevation in feet.
	84. *Labiatæ.*—contd.		
872.	Coleus aromaticus, Benth. (run wild)	3	3,600
873.	„ malabaricus, Benth.	11	3,400
874.	„ spicatus, Benth	8—11	3,400—3,800
875.	Anisochilus carnosus, Wall.	10—12	1,000—4,500
876.	„ dysophylloides, Benth.	2	3,800
877.	Hyptis suaveolens, Poir.	10	600—2,000
878.	Pogostemon parviflorus, Benth.	3	4,700
879.	„ mollis, Benth.	11	5,100
880.	„ speciosus, Benth.	2	5,000—5,300
881.	Colebrookia oppositifolia, Smith	2	4,000—5,000
882.	Scutellaria violacea, Heyne. var. colebrookiana	2	5,000—5,900
883.	Anisomeles ovata, Br.	12—4	1,200—3,000
884.	„ malabarica, Br.	5. 12	650—3,000
885.	Leucas urticæfolia, Br.	6—11	900—2,000
886.	„ lanata, Benth.	4— 9	3,000—5,000
887.	„ montana, Spreng.	6	2,700
888.	„ mollissima, Wall.	11	5,000
889.	„ biflora, Br.	9	2,500
890.	„ marrubioides, Desf.	11	5,000
891.	„ stelligera, Wall.	5	3,500—3,800
892.	„ eriostoma, H. f.	9	5,000
893.	„ ciliata, Benth	6	4,600
894.	„ hirta, Spreng., var. prostrata	9	3,700
895.	„ martinicensis, Br.	10—12	3,000—3,600
896.	„ wightiana, Benth.	4	3,300
897.	„ aspera, Spreng.	5—7	1,200—2,000
898.	„ linifolia, Spreng.	3—8	2,000—3,000
	„ „ var. typica	8	5,500
899.	Leonotis nepetæfolia, Br.	10—11	1,000—2,000
900.	Gomphostemma heyneanum, Wall. var. typica, Prain	8	4,000
901.	Teucrium tomentosum, Heyne	3. 6. 11	4,000—5,000
	85. *Nyctaginaceæ.*		
902.	Bœrhaavia diffusa, L.	5. 10	600—2,000
903.	„ repanda, Willd.	6—10	1,000—3,000
904.	„ fruticosa, Dalz. (?)	5	1,200
905.	„ verticillata, Poir.	4—6	1,000—2,700
906.	Pisonia aculeata, L.	1	650—2,000
	86. *Plantaginaceæ.*		
907.	Plantago major, L.	6	4,000—5,000
	87. *Amaranthaceæ.*		
908.	Celosia argentea, L.	4. 9	3,000—4,000
909.	„ pulchella, Mo.	6	4,100
910.	„ polygonoides, Retz.	5—7	650—2,000
911.	Banalia tyrsiflora, Mo.	2	4,000—5,800

	——	Flowering time.	Elevation in feet.
	87. *Amaranthaceæ.*—contd.		
912.	Allmania nodiflora, Br.	5	600
	„ „ var. aspera	9	2,400
913.	„ albida, Br.	9	500
914.	Digera arvensis, Forsk.	10	650
915.	Amaranthus spinosus, L.	4	1,000—3,000
916.	„ mangostanus, L.	4	3,400
917.	„ viridis, L.	10	1,200
	„ „ var. fasciatus	5	1,200
918.	„ polygamus, L.	1	1,300
919.	Pupalia atropurpurea, Mo.	4	3,400
920.	„ orbiculata, W.	11	1,000
921.	„ lappacea, Moq. var. velutina	7—9	1,300
922.	Psilotrichum calceolatum, Mo.	9	2,600
	„ „ var. tomentosa	7	1,200
923.	Nothosærua brachiata, W.	7—12	2,000—2,700
924.	Ærua javanica, Juss.	1. 5. 11	600—1,400
925.	„ monsonia, Mart.	12	600—2,000
926.	Achyranthes aspera, L., var. rubro-fusca	6	2,000—3,000
	„ „ L., var. porphyristachya	11	3,400
927.	„ bidentata, Blume	11	5,000—5,200
928.	Alternanthera sessilis, Br.	3—4. 7. 12	2,000—4,000
	88. *Chenopodiaceæ.*		
929.	Chenopodium album, L.	10	1,200
930.	„ ambrosioides, L.	5. 9—10	1,200—3,600
931.	Basella rubra, L.	4. 8—10	2,000—3,500
	89. *Polygonaceæ.*		
932.	Polygonum plebejum, Br., var. elegans	4	2,000—3,500
933.	„ tomentosum, Willd.	9—12	1,200—3,600
934.	„ glabrum, Willd.	6. 10	450—2,800
935.	„ lanigerum, Br.	9	4,000
936.	„ stagninum, Ham.	10	1,200
937.	„ flaccidum, Meissn.	2--4, 10—11	3,600—5,000
	90. *Aristolochiaceæ.*		
938.	Aristolochia bracteata, Retz.	10	850
939.	„ indica, L.	10—1	600—3,000
	91. *Piperaceæ.*		
940.	Piper hymenophyllum, Mi.	5	3,700
941.	Peperomia dindigulensis, Mi.	12	4,200
942.	„ portulacoides, A. Dietr. var. courtallensis	12	4,200
	92. *Lauraceæ.*		
943.	Cryptocarya stocksii, Meissn.	2	5,000—5,400

		Flowering time.	Elevation in feet.
	92. *Lauraceæ.*—contd.		
944.	Cinnamomum zeylanicum, Breyn.	2	3,500
945.	„ perrottetii, Meissn.	3	5,000—5,500
946.	Machilus macrantha, Nees	3	4,000—5,200
947.	Alseodaphne semecarpifolia, Nees	12—3	4,000—5,200
948.	Litsæa tomentosa, Heyne	6—11	3,500—5,000
949.	„ ligustrina, Nees	11—12	3,400
950.	„ zeylanica, C. & F. Nees	2. 6. 9—11	4,000—5,000
951.	Cassytha filiformis, L.	11	5,000—5,500
	93. *Elæagnaceæ.*		
952.	Elæagnus latifolia, L.	8—12	3,500—5,000
	94. *Loranthaceæ.*		
953.	Loranthus hookerianus, W. & A.	12—3	3,600—5,000
954.	„ obtusatus, Wall.	5	5,000
955.	„ scurrula, L.	8—11	2,000—4,000
956.	„ tomentosus, Heyne	4. 8. 11	2,500—4,000
957.	„ bracteatus, Heyne	3—6. 11	2,000—4,000
958.	„ cuneatus, Heyne	6. 9	2,700—5,000
959.	„ longiflorus, Desr.	4—5. 10	1,200—4,000
	„ „ var. falcata	4. 11	600—2,000
	„ „ var. amplexifolia	5	5,000
	„ „ var. pubescens	11	4,000
960.	„ loniceroides, L.	6. 11	3,500—5,000
961.	„ capitellatus, W. & A.	5. 9	3,500—4,200
962.	Viscum monoicum, Roxb.	5	1,200
963.	„ verruculosum, W.	12	3,400—3,600
964.	„ orientale, Willd.	4	2,800
965.	„ capitellatum, Sm.	6. 11	2,200—4,000
966.	„ ramosissimum, Wall.	4	1,000
967.	„ angulatum, Heyne	5	2,800—5,000
968.	„ articulatum, Burm.	4	2,000—3,500
	„ „ var. dichotoma	11	3,800
	95. *Santalaceæ.*		
969.	Santalum album, L.	4. 8	800—4,300
970.	Osyris arborea, Wall.	6—12	3,400—5,200
	96. *Balanophoraceæ.*		
971.	Balanophora indica, Wall.	2	5,100—5,800
	97. *Euphorbiaceæ.*		
972.	Euphorbia cristata, Heyne	4. 8. 11	2,800—3,500
973.	Euphorbia linearifolia, Roth	1	600—1,400
974.	„ hypericifolia, L.	8	600—2,000
	„ „ var. bracteolaris	1	800
	„ „ var. parviflora	.....	1,300

	———	Flowering time.	Elevation in feet.
	97. *Euphorbiaceæ.*—contd.		
975.	Euphorbia pilulifera, L.	5. 10	600
976.	„ rosea, Retz.	10	800
977.	„ corrigioloides, Boiss.	9	4,000
978.	„ microphylla, Heyne	2. 7. 10	450—2,000
979.	„ thymifolia, Burm.	7	2,000
980.	„ tirucalli, L.	4. 8	1,000—3,000
981.	„ antiquorum, L.	7	1,000—2,000
982.	„ tortilis, Rottler	3. 11	1,000—2,500
983.	„ fusiformis, Ham.	4	3,400
984.	„ rothiana, Spreng.	6—9. 12	4,000—5,200
985.	Bridelia retusa, Spreng.	4	3,000—4,000
986.	Phyllanthus longipes, Muell.	3. 11	5,000—5,300
987.	„ suberosus, W.	4	3,400—4,000
988.	„ reticulatus, Poir.	1. 4	850—3,300
989.	„ emblica, L.	3	2,500—4,500
990.	„ polyphyllus, Willd.	5, 10—12	2,600—3,600
991.	„ maderaspatensis, L.	12—1	800—3,400
992.	„ niruri, L.	12—1	1,200—3,400
993.	„ simplex, Retz.	11	900
994.	„ debilis, Ham.	6. 12	2,600—3,500
995.	„ wightianus, Muell.	4—6	4,000
996.	Glochidion zeylanicum, A. Juss.	5	4,000
997.	„ neilgherrense, W.	3	5,000—5,600
998.	„ malabaricum, Bedd.	4	4,500
999.	„ velutinum, W.	5	3,600
1000.	Flueggia microcarpa, Blume	4	3,000—4,000
1001.	„ leucopyrus, Willd.	6—8	600—2,700
1002.	Bischofia javanica, Blume	2—3	4,000—5,000
1003.	Jatropha glandulifera, Roxb.	10	1,000—1,500
1004.	„ heterophylla, Heyne	4—6	2,800—3,200
1005.	„ gossypifolia, L.	5	600
1006.	„ wightiana, Muell.	1	1,000
1007.	„ curcas, L.	4. 10	1,200—3,500
1008.	Croton aromaticus, L.	3	4,700
1009.	Givotia rottleriformis, Griff.	3—5	3,000—4,000
1010.	Chrozophora plicata, A. Juss.	7—1	650—2,300
1011.	Claoxylon mercurialis, Thw.	10	600
1012.	Acalypha paniculata, Miq.	6—10	3,000—4,000
1013.	„ fruticosa, Forsk.	4. 10	1,000—3,000
1014.	„ alnifolia, Klein.	1. 4. 10	400—2,000
1015.	„ indica, L.	9—1	800—2,000
1016.	„ brachystachya, Horn.	11	4,000
1017.	„ fallax, Muell	10	600
1018.	„ ciliata, Forsk.	11—12	1,000—5,000
1019.	Trewia nudiflora, L.	1	600—1,500
1020.	Mallotus barbatus, Muell	5	5,000—5,300
1021.	„ walkeræ, H. f.	5	5,000—5,300
1022.	„ philippinensis, Muell.	3—4. 10	3,500—5,000
1023.	Homonoia riparia, Lour.	6	1,200—2,000
1024.	Gelonium lanceolatum, Willd.	3. 6	1,000—3,500
1025.	Tragia involucrata, L.	4	3,000—4,000
	„ „ var, angustifolia	11	4,000

	——	Flowering time.	Elevation in feet.
	97. *Euphorbiaceæ*,—contd.		
1026.	Tragia cannabina, L.	5. 10—11	800—2,200
1027.	Excœcaria crenulata, W.	6. 9	4,000—4,200
1028.	„ robusta, H. f.	3	3,500
1029.	Sebastiana chamælea, Muell.	4. 8—10	1,500—3,500
	98. *Urticaceæ*.		
1030.	Holoptelea integrifolia, Planch.	1. 5	600—3,500
1031.	Celtis tetrandra, Roxb.	2	4,200
1032.	Trema orientalis, Blume	4. 12	3,400—4,000
1033.	Streblus asper, Lour.	3	600—3,000
1034.	Plecospermum spinosum, Trecul.	6	2,600—4,200
1035.	Ficus gibbosa, Blume, var. parasitica, Koen.	12	3,000—4,000
1036.	„ dalhousiæ, Miq. [?]	......	......
1036. *a*.	„ bengalensis, L.	3—4	400—3,000
1037.	„ mysorensis, Heyne	3—4	2,000—3,500
1038.	„ tomentosa, Roxb.	6	2,000—3,000
1039.	„ benjamina, L.	4	2,000—4,000
1040.	„ religiosa, L.	4	400—4,000
1041.	„ arnottiana, Mig.	4	3,500
1042.	„ infectoria, Roxb.	5—6	3,500—4,100
1043.	„ heterophylla, L. f.	10	.650
1044.	„ glomerata, Roxb.	4. 10	2,000—5,600
1045.	Girardiana heterophylla, Dcne.	11—12	4,000—5,300
1046.	Pilea trinervia, W.	8—11	5,000—5,300
1047.	Artocarpus integrifolia, L.	1—2	4,000—5,300
1048.	Pouzolzia indica, Gaud.	8	3,600
	„ „ var. tetraptera	11	1,200
1049.	„ auriculata, W.	12	2,000
1050.	„ pentandra, Benn.	11	3,600
1051	„ wightii, Benn.	8	5,500
1052.	„ bennettiana, W.	8	5,000
1053.	Debregeasia velutina, Gaud.	8	4,500—5,200
	99. *Salicaceæ*.		
1054.	Salix tetrasperma, Roxb.	11—12	1,200—4,200
	100. *Hydrocharidaceæ*.		
1055.	Blyxa roxburghii, Rich.	12	3,800
1056.	Ottelia alismoides, Pers.	10—1	1,200—3,300
	101. *Burmanniaceæ*.		
1057.	Burmannia cœlestis, Don.	11	5,400
	102. *Orchidaceæ*.		
1058.	Oberonia verticillata, W.	11	5,300
1059.	„ brunoniana, W.	12	5,000
1060.	„ lindleyana, W. (?)	2	5,000—5,300

		Flowering time.	Elevation in feet.
	102. *Orchidaceæ.*—contd.		
1061.	Dendrobium aqueum, Lindl.	3	5,000
1062.	Cirrhopetalum thomsoni, H. f.	11	5,000—5,200
1063.	Pachystoma senile, Reichb.	3	5,000
1064.	Luisia teretifolia, Gaud.	4. 8	3,500—4,000
1065.	Vanda parviflora, Lindl.	5	3,400
1066.	„ spathulata, Spreng.	4—6	2,900
1067.	„ roxburghii, Br.	4	2,000
1068.	Diplocentrum recurvum, Lindl.	5	4,100
1069.	Vanilla wightiana, Lindl.	4	2,700—3,000
1070.	Anæctochilus elatus, Lindl.	3	5,000—5,500
1071.	Spiranthes australis, Lindl.	2	5,200
1072.	Zeuxine longilabris, Benth.	2	4,200
1073.	Habenaria barbata, W.	8—11	3,600—4,200
1074.	„ gibsoni, H. f.	11	5,000
1075.	„ longicornu, Lindl.	9	5,500
1076.	„ platyphylla, Spreng.	8	2,500
1077.	„ plantaginea, Lindl.	8—11	2,400—3,800
1078.	„ longicalcarata, A. Rich.	8—10	3,600—4,800
1079.	„ viridiflora, Br.	8	4,000
	„ „ var. dalzellii	9—10	4,000—5,000
1080.	Satyrium nepalense, Don	11	4,800—5,500
	103. *Scitaminaceæ.*		
1081.	Globba bulbifera, Roxb.	8	3,600
1082.	Curcuma neilgherrensis, W.	2	5,900
1083.	„ montana, Rosc.	5	3,600
1084.	Hedychium coronarium, Koen., var. flavescens	5. 8	4,000—5,000
	„ „ „ var. maxima.	10	4,600
1085.	Canna indica, L., var. orientalis (run wild)...	2	3,700
	104. *Hæmodoraceæ.*		
1086.	Ophiopogon intermedium, Don	8	5,400
1087.	Sanseviera roxburghiana, Schult.	6—7	1,000—3,000
	105. *Amaryllidaceæ.*		
1088.	Curculigo orchioides, Gaertn.	3—4	3,400—5,000
1089.	Crinum asiaticum, L.	5	3,500
1090.	„ ensifolium, Roxb.	11—1	650
1091.	„ latifolium, L....	5	3,500—5,000
1092.	Pancratium parvum, Dalz.	5	5,200
	106. *Dioscoreaceæ.*		
1093.	Dioscorea dæmona, Roxb.	1. 10	1,000—3,500
1094.	„ tomentosa, Heyne	8	2,600—4,000
1095.	„ oppositifolia, L.	5. 8	3,000—5,000
1096.	„ nummularia, Lam....	8	3,500

		Flowering time.	Elevation in feet.
	107. *Liliaceæ.*		
1097.	Smilax aspera, L.	9	4,500—5,300
1098.	„ prolifera, Roxb.	2	3,600—5,000
1099.	Asparagus racemosus, Willd.	4. 9	3,000—4,200
1100.	Chlorophytum attenuatum, Baker	8	3,400
1101.	Urginea wightiana, H. f.	3	1,000
1102.	Scilla indica, Baker	4—10	500—5,200
1103.	Lilium neilgherrense, W.	8—11	5,000—5,500
1104.	Iphigenia indica, Kunth	2. 8—10	500—5,000
1105.	Gloriosa superba, L.	6—10	500—4,000
	108. *Pontederiaceæ.*		
1106.	Monochoria vaginalis, Presl.	7. 12	2,000—3,400
	109. *Commelinaceæ.*		
1107.	Commelina nudiflora, L.	11	4,000
1108.	„ hasskarlii, Clarke (?)	11	5,000
1109.	„ benghalensis, L.	10—11	650—1,400
1110.	„ forskalii, Vahl	8	3,700
1111.	„ clavata, Clarke	11	5,000
1112.	„ obliqua, Ham.	10	1,000—1,400
1113.	„ albescens, Hassk.	5	3,600
1114.	„ ensifolia, Br.	5	3,800
1115.	Aneilema spiratum, Br.	11	4,000
1116.	„ nudiflorum, Br.	3	5,100
1117.	„ vaginatum, Br.	10	2,000—3,500
1118.	„ paniculatum, Wall.	11	4,600—5,200
1119.	Cyanotis papilionacea, Schult. f.	10	800
1120.	„ cristata, Schult. f.	10—11	650—5,000
1121.	„ arachnoidea, Clarke	8—11	3,800—5,200
1122.	„ pilosa, Schult, f.	4—5	3,300—3,800
1123.	„ villosa, Schult f.	11	5,000
1124.	„ fasciculata, Schult. f. (?)	11	3,800
1125.	„ axillaris, Roem. & Sch.	10—1	650—3,400
	110. *Palmaceæ.*		
1126.	Phœnix acaulis, Ham.	12	3,000—5,000
1127.	„ humilis, Royle	12	3,000—5,000
1128.	Calamus rotang, L.	3	5,000—5,800
	111. *Pandanaceæ.*		
1129.	Pandanus fascicularis, Lam.	6. 10	1,200—3,900
	112. *Typhaceæ.*		
1130.	Typha angustata, Chaub. & Bory.	6	1,000—3,000

		Flowering time.	Elevation in feet.
	113. *Aroidaceæ.*		
1131.	Cryptocoryne roxburghii, Schott.	1	650
1132.	Pistia stratiotes, L.	12	600—3,000
1133.	Arisæma tortuosum, Schott.	5. 9	4,000—5,200
1134.	„ leschenaultii, Blume	3. 5	5,000—5,300
1135.	Remusatia vivipara, Schott.	12	5,000
1136.	Colocasia antiquorum, Schott.	10—12	1,200—4,700
	114. *Lemnaceæ.*		
1137.	Lemna gibba, L.	....	800—3,000
1138.	„ polyrrhiza, L.	......	800—3,000
1139.	Wolffia arrhiza, Wimm.	....	800—3,000
	115. *Alismaceæ.*		
1140.	Limnophyton obtusifolium, Mi. 9	12	2,600—3,500
1141.	Sagittaria sagittifolia, L. (?)	6	2,700
	116. *Naiadaceæ.*		
1142.	Aponogeton crispum, Thunb.	12	3,400
1143.	„ echinatum, Roxb.	11—12	3,400
	117. *Eriocaulaceæ.*		
1144.	Eriocaulon odoratum, Dalz.	3	3,500
1145.	„ sp.	2. 8	5,300—5,500
1146.	„ sp.	2	5,300
	118. *Cyperaceæ.**		
1147.	Kyllingia triceps, Rottl.	6	2,000—4,000
1148.	Fimbristylis junciformis, Kunth (?)	6	2,800
1149.	Scirpus barbatus, Rottl.	6	......
	119. *Gramineæ.*†		
1150.	Paspalum scrobiculatum, L.	2	1,200—3,600
1151.	Digitaria sanguinalis, Scop., var. extensa	7	1,000—3,000
1152.	Isachne kunthiana, W. & A.	9	1,200
1153.	Panicum isachne, Roth.	11	4,000
1154.	„ punctatum, Burm.	1	1,250
1155.	„ flavidum, Retz.	9	4,000
1156.	„ ramosum, L.	7	2,000
1157.	„ interruptum, Willd.	12	3,400
1158.	„ trigonum, Retz.	12—2	3,400—4,000

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* A number of species of this order are waiting for identification.

† Mr. Fischer remarks that notes as regards distribution of grasses were only taken in a few instances.

	—	Flowering time.	Elevation in feet.
	119. *Gramineæ*—contd.		
1159.	Oplismenus compositus, Beauv.	11	3,000—5,000
1160.	Setaria glauca, Beauv.	9	1,200—4,000
1161.	,, intermedia, Roem. & Sch.	9	5,000
1162.	Pennisetum alopecurus, Steud.	9—10	3,300—4,000
1163.	,, cenchroides, Rich. var., echinoides	8	1,300
1164.	Cenchrus biflorus, Roxb.	10	500
1165.	Leersia hexandra, Sw.	2	4,000
1166.	Trachys mucronata, Pers.	10—11	600—2,000
1167.	Tragus racemosus, Scop.	7	1,200—2,000
1168.	Perotis latifolia, Ait.	7—11	600—2,100
1169.	Coix lachryma jobi, L.	2. 11	1,200—5,000
1170.	Polytoca barbata, Stapf	2	3,900
1171.	Imperata arundinacea, Cyrill.	1	1,000—4,000
1172.	Saccharum spontaneum, L.	11	2,000
1173.	Ischæmum laxum, Br.	2	3,600
1174.	Rottbœllia exaltata, L. f.	11—2	3,600
1175.	Apluda varia, Hack	11—2	600—3,600
1176.	Manisuris granularis, L. f.	10	3,000—4,000
1177.	Andropogon foveolatus, Del.	2	3,900
1178.	,, pumilis, Roxb.	11	500—1,200
1179.	,, pertusus, Willd.	11	500—1,300
1180.	,, odoratus, Lisboa	2	3,700
1181.	,, halepensis, Brot.	2—11	900—4,100
1182.	,, serratus, Thunb.	2	3,600
1183.	,, wightianus, Steud.	5	600
1184.	,, monticola, Schult. (?)	2	3,600
1185.	,, caricosus, L.	1	1,300
1186.	,, contortus, L.	5—10	500—5,000
1187.	,, iwarancusa, Jones (?)	8—9	1,000—2,500
1188.	,, schœnanthus, L.	5	3,000—5,000
1189.	,, nardus, L.	5	3,000—5,000
1190.	Iseilema wightii, Anders.	9—11	600—1,300
1191.	Aristida adscensionis, L.	11	500—2,200
1192.	,, hystrix, L. f.	5—9	600—2,000
1193.	Sporobolus spicatus, Kunth	3	2,000
1194.	Microchloa setacea, Br.	7	2,000
1195.	Cynodon dactylon, Pers.	7—8	400—4,000
1196.	Chloris incompleta, Roth.	11—12	2,700
1197.	,, barbata, Sw.	7. 11	500—1,500
1198.	Eleusine ægyptiaca, Desf.	7—10	500—2,500
1199.	Pappophorum elegans, Nees	7	600—2,000
1200.	Elytrophorus articulatus, Beauv.	11	4,000—5,000
1201.	Eragrostis aspera, Nees	11	2,000
1202.	,, ciliaris, Link.	1	650
1203.	,, stenophylla, Hochst.	1	1,000
1204.	,, major, Hook.	11—1	1,000—2,000
1205.	,, coromandelina, Trin.	8—1	1,000—2,500
1206.	,, brachyphylla, Stapf.	11	650
1207.	Oropetium thomæum, Trin.	8—11	1,200—4,000
1208.	Bambusa arundinacea, Willd.	3	1,000—3,500
1209.	Dendrocalamus strictus, Nees.	12—4	1,000—3,500

FILICES.

	—	Fructification.	Elevation.
	120. *Polypodiaceæ.*		
1210.	Alsophila latebrosa, Hook.	8	5,000—5,300
1211.	Leucostegia pulchra, Don	8	5,000—5,300
1212.	Microlepia speluncæ, L.	5. 12	5,000—5,300
1213.	Adiantum lunulatum, L.	8	4,100
1214.	„ caudatum L.	8	2,000—3,600
1215.	„ hispidulum, Sw.	3	4,600
1216.	Cheilanthes mysorensis, Wall.	4. 8	2,400—3,500
1217.	„ tenuifolia, Sw.	4	3,500
1218.	„ farinosa, Kauf.	8. 9	4,200—5,000
1219.	Pteris longifolia, L.	6	2,700
1220.	„ pellucida, Presl.	8	3,300
1221.	„ quadriaurita, Retz.	8. 12	5,000—5,300
	„ „ var. argentea	8	5,000—5,300
1222.	„ patens, Hook	6	3,700
1223.	„ aquilina, L.	10—12	3,000—5,200
1224.	Asplenium trichomanes, L. [?]	12	3,600
1225.	„ normale, Don var. B.	8	5,000—5,300
1226.	„ zenkerianum, Kze.	2. 8	5,000—5,300
1227.	„ latifolium, Don	8	5,000
1228.	„ furcatum, Thunb.	4	3,500
1229.	„ unilaterale, Lam.	8	5,000—5,300
1230.	Actinopteris dichotoma, Bedd.	4—6	600—3,600
1231.	Cyrtomium falcatum, Sw., var. caryotideum, Wall.	8	5,000
1232.	Aspidium cicutrarum, Sw.	8	4,200
1233.	Pellæa falcata, Fée.	9. 12	4,000—5,200
1234.	„ concolor, Langs & Fisch.	4. 10	3,000—4,000
1235.	Lastrea coniifolia, Wall.	8	5,000
1236.	„ aristata, Sw.	8	5,000
1237.	„ hirtipes, Bl.	8	5,000
1238.	„ filix-mas, L., var. cochleata, Don	11	5,000
1239.	„ boryana, Willd. (?)	6	4,000
1240.	Nephrodium molle, Desv.	6	3,700
1241.	Nephrolepis cordifolia, L.	8	4,000—5,000
1242.	Drynaria quercifolia, L.	9	4,400
1243.	Pleopeltis linearis, Thunb.	8	5,000
1244.	„ hastata, Thunb.	8. 11	5,200—5,400
1245.	„ membranacea, Don	8	5,000
1246.	Loxogramme lanceolata, Sw.	8	5,000
1247.	„ involuta, Don	8	5,000
1248.	Antrophyum plantagineum, Kaulf.	8	5,000
1249.	Hemionitis arifolia, Bedd.	10	3,000—4,000
1250.	Elaphoglossum viscosum, Sw.	8	5,000
1251.	Polybotrya appendiculata, Willd, var. aspleniifolia.	3	5,000
1252.	Gymnopteris variabilis, Hook., var. lanceolata, Hook.	3	5,000—5,300
1253.	„ contaminans, Wall. (?)	8	5,000—5,300

—	Fructification.	Elevation.
121. *Ophioglossaceæ.*		
1254. Ophioglossum reticulatum, L.	8	3,900
1255. Botrychium virginianum, L., var. lanuginosum	8	5,200—5,400
122. *Salviniaceæ.*		
1256. Azolla pinnata, Br.	6	2,800
123. *Marsiliaceæ.*		
1257. Marsilia quadrifoliata, L.	12	2,000
1258. „ minuta, L.	9. 12	2,000—5,100
124. *Lycopodiaceæ.*		
1259. Lycopodium phlegmaria, L.	8	5,000—5,700

SOME NOTES ON
PINTIA FERREA, Wlk., *CYCLOSIA PAPILIONARIS*, Drury,
AND
HETERUSIA MAGNIFICA, Butl.

BY

CHAS. B. ANTRAM,

Entomologist to the Indian Tea Association.

(*With a Plate.*)

FAMILY—ZYGŒNIDÆ.

PINTIA FERREA, Wlk., and *CYCLOSIA PAPILIONARIS*, Drury.

That the male and female of certain species of Zygœnid moths find themselves under different names, and even genera, is not, perhaps, very extraordinary when one considers that the classification of many of the Lepidopterous insects has had to be made from single specimens only, instead of from long series showing examples of both sexes.

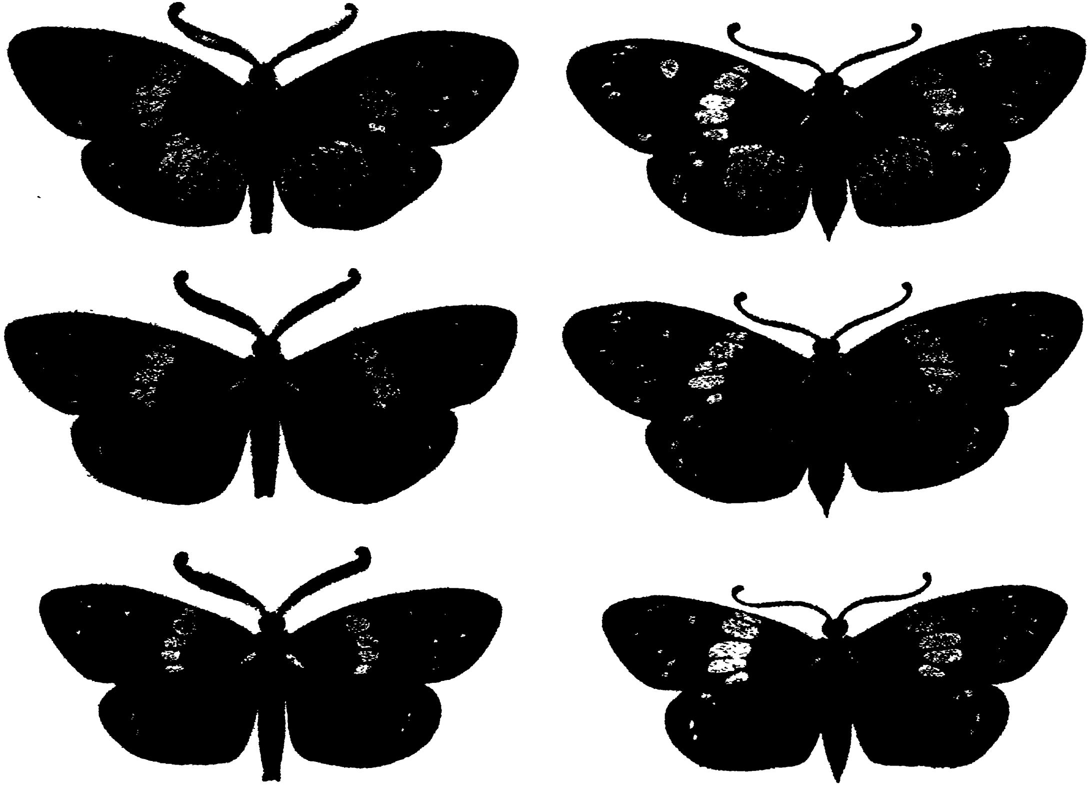
With some of the *Zygœnidæ*, in particular, classification has been difficult owing to the great difference in the colour and markings of the wings of the two sexes, and it is only by breeding out the moths from batches of larvæ that one can make sure of their relationship.

From specimens bred of both sexes in the early months of 1905, and again in June 1906, I came to the conclusion that *Pintia ferrea*, Wlk., and *Cyclosia Papilionaris*, Drury, were sexes of one species, but it was only last April that I could confirm this. From a large number of larvæ obtained on the 1st November 1906 (these pupated in my breeding cages 10 days afterwards), I bred a fairly long series of the moths of both sexes in the following April, several pairs of which immediately copulated. One pair, in particular, was noticed to remain in copulation for 13 hours. Eggs, however, were not laid by the moths in captivity.

The caterpillars of the 2nd brood are full fed early in July, and at this time of the year the chrysalis stage only lasts some 15 to 21 days as compared with five months during the cold weather. The moths emerge in the early half of August.

At the time of taking these notes I had quite overlooked an entry by Sir George Hampson in Vol. XVI, p. 193, of this Journal which reads as follows:—

> P. 269. Under CYCLOSIA insert (Syn.) *Pintia*, p. 258, 545 *Pintia ferrea* is the ♂ of 577. CLYCLOSIA PAPILIONARIE'S and 575, *C. nigrescens* and 576, *C. parvula* are varieties. 547. *Pintia*, LATIPENNIS is the ♂ of 578. CYCLOSIA *australinda*, many specimens of both sexes bred (T. R. Bell).



Chas. B. Antram del.

The venations of the forewing vary considerably in certain individuals. Usually vein 6 is from angle of cell or stalked with 7, 8 and 9. In some specimens vein 9 rises from nearer angle of cell than veins 7 and 8, and in others, veins 7, 8 and 9 rise together from one point, *i.e.*, are forked.

HETERUSIA MAGNIFICA, Butl.

This insect might be bred in the same way, from a batch of eggs obtained from a typical pair of the moths, as it is possible that either or all of the following species (*H. edocla, H. virescens, H. ædea*) will turn out to be varieties only of *H. magnifica*, Butl. This I definitely hope to find out during the coming year.

Investigations that I made in Assam and the Duars in 1906, for the Indian Tea Association, with regard to a caterpillar pest of tea, at that time seriously damaging gardens, proved the insect to be *Heterusia magnifica*, Butl. Of the millions of moths collected for destruction there were 3 distinct varieties—the common or typical form has the band of the hind wing dark orange, in another form the band is such a pale yellow that it almost approaches white as in *H. virescens*, Butl. A third and most noticeable variety has no band to the hindwing, but is entirely black except for 3 or 4 small yellow spots towards the outer margin which is shot with blue as in all the forms. (See plate which shows the 3 varieties, males to the left and females to the right.)

These were all moths of one species.

There is another form which has, as in *H. edocla*, Doubl., a spot on the underside of costa of hind wing, and in fact, the underside of the only two specimens that I have of *H. edocla*, supplied from Sikkim out of Mr. G. C. Dudgeon's collection is identical with that of the no-band forms of *H. magnifica*, Butl., found in Assam, the Duars, Cachar and Sylhet. I also found that the basal black area of the hind wing, differed in size in the banded forms. Intermediate varieties of the band and no-band forms are numerous. The spots also are in some cases very large, while in others almost obsolete. The forewing greatly differs in colour and can be anything from dark green as in *H. edocla* and *virescens* to a purple-brown as in *H. magnifica*.

During the greater part of the year, a period of about 68 days is passed from the time the eggs are laid till moths are produced, the time being distributed as follows:—

Egg—hatches in 8 to 12 days.
Caterpillar—feeding about 5 weeks.
Chrysalis—17 to 21 days.

Four broods of the insect take place during the year, the moth appearing in January, May, end of July and in October.

A FURTHER LIST OF BIRDS FROM THE CHINDWIN, UPPER BURMA.

BY

CYRIL HOPWOOD, I.F.S.

I have read with great interest Major Mears' list of birds from the Chindwin. This being my third season in the same locality, I am sending a small list of birds which I have met with, and which I presume were not observed by Major Mears, as I think they are sufficiently uncommon to have been included in his list had he observed them. I also give a full list of the ducks, as Major Mears did not include any in his paper.

62. DRYONASTES RUFICOLLIS.—Rufous-necked Laughing Thrush. A flock in deserted village land near the Myittha river.

237. PTERUTHIUS ERYTHROPTERUS.—Red-winged Shrike-Tit. A single male, at about 2,500 feet in open jungle.

357. PNOEPYGA PUSILLA.—The Brown Wren. A single specimen.

535. SPODIOPSAR CINERACEUS.—The Grey Starling. I saw a pair of Starlings, feeding with a flock of Mynas at Kaya, above Kindat, in January. I am not sure whether they were this species, but think it probable. Though quite close, I was unable to shoot one, for fear of spoiling a duck shoot, and I did not see them again.

554. ÆTHIOPSAR ABLICINCTUS.—The Collared Myna. Common above Kindat. Capt. Harington has already described the breeding of this bird and *Æ. grandis* in the Journal.

646. RHYACORNIS FULIGINOSUS.—Plumbeous Redstart. Not uncommon along jungle streams.

705. ZOOTHERA MARGINATA.—Lesser Brown Thrush. One specimen.

(I also saw a bird exactly like an English Thrush, but could not get a shot at it.)

1006. MEGALÆMA MARSHALLORUM.—Great Himalayan Barbet.

1078. CHÆTURA INDICA.—Brown-necked Spine-tail. These birds are often seen playing over a pond in the jungle at about 3,000 feet.

1096. LYNCORNIS CERVINICEPS.—The Great-eared Nightjar. I met with this bird, and got four nests, or rather eggs, in the Mingin forest division. It nests in March and April, and apparently incubates a single egg.

1246. LOPHOSPIZIAS TRIVIRGATUS.—Crested Goshawk. I obtained a specimen last year, and saw another a few days ago.

1249. PERNIS CRISTATUS.—Crested Honey-Buzzard. Obtained a nest with eggs in April.

1251. BAZA LOPHOTES.—Black-crested Baza. Saw a pair collecting nesting materials at the beginning of April.

1262. ERYTHROPUS AMURENSIS.—Eastern Red-legged Falcon. Large numbers were seen at Kindat in November, hawking insects at dusk.

1267. MICROHIERAX EUTOLMUS.—Red-legged Falconet. I saw one a few days ago.

1302. ALSOCOMUS PUNICEUS.—Purple Wood Pigeon. I several times saw and heard a bird which I take to be this species: it was certainly not an Imperial Pigeon. They are excessively shy and I could never get a shot.

1325. PAVO MUTICUS.—Burmese Pea-fowl. Common above Homalin and stragglers occur as far south as Yuwa.

1367. ARBORICOLA BRUNNEIPECTUS.—Brown-crested Hill-Partridge. One specimen.

1410. GRUS SHARPII.—Burmese Sarus. Occurs occasionally at Kindat.

1425. GLAEROLA ORIENTALIS.—Large Indian Pratincole. Sparingly distributed in the Kindat District.

1439. CHARADRIUS FULVUS.—Eastern Golden Plover. Occasionally met with when snipe shooting.

1482. SCOLOPAX RUSTICULA.—The Wood-cock. I have twice seen Woodcock in the Kindat District.

1488. ROSTRATULA CAPENSIS. –Painted Snipe. Breeds at Mingin.

1523. PELECANUS PHILIPPENSIS.—Spotted-billed Pelican. Common above Kindat, and I believe breeds in the district.

1579. ANSER FERUS.—Grey Leg Goose.

1583. ANSER INDICUS.—Barred-headed Goose.

1584. SARCIDIORNIS MELANONOTUS.—Comb Duck. Not found above Mingin.

1585. ASARCORNIS SCUTULATUS.—White-winged Wood-Duck. Sparingly distributed in the Kindat District, usually found in pairs in jungle streams.

1588. CASARCA RUTILA.—Brahminy Duck.

1589. DENDROCYCNA JAVANICA.—Whistling Teal.

1591. NETTOPUS COROMANDELIANUS.—Cotton Teal.

1592. ANAS BOSCAS.—Mallard. Rare.

1593. ANAS PŒCILORHYNCHA.—Spot-bill. One specimen.

POLIONETTA HARINGTONI.—Burmese Spot-bill (Oates). Common and breeds. I have also obtained specimens intermediate between this and the foregoing species.

1594. EUNETTA FALCATA.—Crested Teal. One male in January 1906.

1595. CHAULELASMUS STREPERUS.—Gadwall.

1597. NETTIUM CRECCA.—Common Teal.

1599. MARECA PENELOPE.—Wigeon. One at Kindat, November 1907.

1600. DAFILA ACUTA.—Pintail.

1601. QUERQUEDULA CIRCIA.—Garganey.

1602. SPATULA CLYPEATA.—Shoveller.

1604. NETTA RUFINA.—Red-crested Pochard. One female, November 1905.

1605. NYROCA FERINA.—The Pochard.

1606. NYROCA FERRUGINEA.—White-eyed Duck.

1607. NYROCA BAERI.—Eastern White-eyed Duck. One specimen, January 1906.

1609. NYROCA FULIGULA.—Tufted Duck. Occasionally met with.

BREEDING HABITS OF SOME SNAKES AND LIZARDS.

BY

REV. F. DRECKMANN, S.J.

The name viper was originally applied to all poisonous snakes under the idea that this class was distinguished by its viviparous habits ; this idea has long been found to be erroneous as all the poisonous colubrine land-snakes, the cobra, krait, &c., are, as far as we know, truly oviparous, and on the other hand the colubrine water-snakes, whether poisonous or not, are viviparous; many of them inhabit the open sea and it would not be easy for them to find a place where they could safely deposit their eggs. Those poisonous snakes, however, which belong to the now restricted order of "vipers"—viperidæ—were still considered to deserve their name and to be without exception viviparous, but of late their claim to this distinction has also become more than doubtful.

In 1904 we received a note from the Rev. G. A. Miller, of St. Joseph's College, Darjeeling (*c.f.* Journal, B. N. H. S., XV, page 729), in which he informed us that he had received a number of eggs which on being hatched turned out to be eggs of *Lachesis monticola;* from two of them the young ones issued whilst they were under observation. The Rev. gentleman was kind enough to send us one of the young ones together with the shell from which it had escaped, and one of the eggs cut open with the fully developed embryo inside : both are undoubtedly *L. monticola*, one of the *Crotalidæ* or pit-vipers. The Editors of our journal added the remark: "We now possess the important evidence that this viperine snake is oviparous." Its very close ally, however, *L. gramineus*—a common snake of our ghauts—is certainly viviparous; for this I have very good evidence as one of them gave birth to a healthy family of fully developed live young ones whilst I held it in my hand.

At our last meeting Col. Bannerman showed us two very interesting exhibits. One of them was a cluster of eggs laid by a Russell's viper in captivity and the other one a batch of young ones born alive by another snake of the same species. Here we have incontestable evidence of the same snake—a typical viper—being both oviparous and viviparous. It appears from these facts that a snake being oviparous or viviparous cannot any more be considered as a generic or even specific distinction ; it seems to be more or less an individual habit. I think Russell's viper is ordinarily viviparous ; for this I have corroborative evidence, as one of them gave birth to live young ones in my snake-box. These young Daboias seem to be very greedy; among those exhibited by Col. Bannerman one had evidently overrated its capacity and was choked in the attempt of swallowing another one of the same brood. Something similar happened to me ; I had to leave Khandala when the young ones were just eight days old ; as I arrived rather late in Bombay I turned my snakes out into an empty box and left them for the night ; when I looked at them the next morning I found one of the young ones dead and another one missing, and on examining the dead one I found the missing one inside.

I should like to make here a slight digression. Many snakes, *e.g.*, the krait, live habitually on other snakes and they are consequently accused of cannibalism, I think unjustly. A fish is not called a cannibal because it feeds on other fish, and a hawk is a " noble bird " although it tears to pieces and devours other birds without remorse : why then should a snake be called a cannibal when it does nothing worse ? I confess I can find no excuse in the case of the young Daboias : to make a feast of one's own brother or sister and at such a tender age certainly shows a deplorable moral depravity.

Some lizards exhibit a similar want of consistency in their breeding habits as we have found among snakes. Speaking of *Mabouia macularia*, Mr. Boulenger says (Rept. B.I., page 190): " This species is stated by Theobald to be oviparous whilst its close ally *M. carinata* is, like most scincoids, viviparous." Mr. Theobald's authority is unimpeachable ; he could not have made such a positive, unqualified statement : " *M. carinata* is viviparous " (Catalogue of Reptiles of B.I., page 50) without having made sure of the fact, and I think we may take it as proved that *M. carinata* is viviparous. But it is also oviparous. Some fifteen years ago, when preparing a specimen of the same *M. carinata* for my collection, I found that it contained about a dozen eggs ; they were fully formed and covered with a strong leathery shell. It struck me that if these eggs were not intended to be laid so as to require some protection against external dangers, these strong coverings would be a perfectly useless extravagance and I could not help suspecting that some members of the family were oviparous. My suspicion was confirmed when I received at the beginning of this year another specimen with a number of eggs which it had laid in captivity. I thought I could do no better than send both specimens together with their eggs to Mr. Boulenger for an authoritative opinion on the case ; he was kind enough to acknowledge the receipt and to give me some additional information which I am sure will interest other members besides myself. Mr. Boulenger says : " It is well known that closely allied species of lizards and snakes differ with regard to the manner in which the young are brought forth. Thus our sand lizard (*Lacerta agilis*) lays eggs, while the common species (*L. vivipara*) is ovo-viviparous. Some species of *Tropidonotus* are oviparous, others are ovo-viviparous. In the extra-Indian species of *Mabouia*, so far as notes have been made of them, we also know the two types of parturition, so that Mr. Theobald's observation did not seem to me improbable. I have myself made an observation which will interest you. The N. African and S. European Scincoid lizard *Chalcides ocellatus* has been repeatedly observed in Algeria to produce live young. Now a specimen from Ghiza, Egypt, which was given to me a short time ago, has laid eggs in my vivarium which have a parchment-like shell even tougher than in *M. carinata.* I am making inquiries to ascertain whether this is normal oı abnormal in Egypt."

There is another remark in Mr. Boulenger's letter which I should like to quote ; after regretting his inability of making observations on the habits of Indian Reptiles he continues : " Naturalists in India have the opportunity of making such observations, and I am glad to see so many recorded in the Journal of the Bombay Society."

DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA.

BY

E. MEYRICK, B.A., F.R.S., F.Z.S.

VI.

(*Continued from page* 160 *of this Volume.*)

GELECHIADÆ.

Aristotelia thalamitis, n. sp.

♂♀. 11-12 mm. Head glossy pale ochreous, with fuscous lateral stripes, sides yellower. Palpi whitish-ochreous, irrorated with blackish except at apex of joints, scales of second joint roughened above towards apex, terminal joint thickened, somewhat shorter than second. Antennæ dark fuscous, towards apex irregularly dotted with whitish. Thorax whitish-ochreous irrorated with dark fuscous, and mixed on sides with yellowish. Abdomen shining bronzy-fuscous. Forewings elongate, very narrow, attenuated from ⅓, acute ; 6 and 7 out of 8 ; whitish-ochreous densely irrorated with fuscous and dark fuscous, sometimes mixed with white in disc ; oblique blackish marks on costa near base and at ¼, and blackish marks on fold obliquely beyond each of these, second representing plical stigma and edged posteriorly with ochreous-yellowish suffusion, which is sometimes extended along fold ; round black dots beneath middle of costa and in disc at ⅔, edged with ochreous-yellowish suffusion ; some ochreous-yellow suffusion towards base of dorsum, and towards apex ; costa posteriorly suffused with dark fuscous, and marked with three or four white specks ; several white specks along termen : cilia light grey, at apex ochreous-yellowish with two blackish lines. Hindwings ¾, cilia 5 ; grey, thinly scaled in disc anteriorly ; cilia light grey.

Khasi Hills, in September and October ; thirty specimens.

Aristotelia citrocosma, n. sp.

♂♀. 7-9 mm. Head pale shining fuscous, sides brassy-yellow, face pale yellowish. Palpi light yellow, a subapical ring of second joint and anterior edge of terminal joint dark fuscous, terminal joint longer than second. Antennæ dark fuscous, with white rings at intervals of three joints. Thorax brassy-yellow, patagia light fuscous. Abdomen grey. Forewings elongate-lanceolate ; 6 separate ; fuscous, darker-irrorated ; markings brassy-yellow ; a very oblique fascia near base ; a thick streak running from ¼ of costa to near dorsum about middle, thence curved upwards to disc beyond middle, again angulated downwards to tornus and continued along termen to apex ; an oblique strigula on costa beyond origin of this, and another at ¾ : cilia grey, round apex yellow. Hindwings ¾, cilia 4 ; grey, thinly scaled in disc ; cilia pale grey.

Khasi Hills, from September to November ; Maskeliya, Ceylon, in March and May (Pole) ; thirty specimens.

Aristotelia galeotis, n. sp.

♂ ♀. 7-8 mm. Head ochreous-whitish, partially sprinkled with dark fuscous. Palpi ochreous-whitish, second joint with blackish irroration increasing upwards except at apex, and rather thickened towards apex, terminal joint white with two blackish rings, as long as second. Antennæ white, ringed and narrowly banded with blackish. Thorax whitish-ochreous, partially sprinkled with blackish. Abdomen grey, in ♂ whitish-ochreous towards base. Forewings elongate-lanceolate ; 6 separate ; brownish-ochreous or yellow-ochreous, paler towards base, irregularly sprinkled with black ; a small round spot of black irroration on fold at ⅓, another in disc about middle, a third on costa at ⅔, and a fourth rather larger and more triangular on tornus : cilia whitish-ochreous, with basal dots of blackish irroration. Hindwing under ½, cilia 7, rather dark grey, thinly scaled in disc ; cilia grey.

Maskeliya, Ceylon, in January and February ; six specimens (Pole).

Aristotelia leucophanta, n. sp.

♂ ♀. 10 mm. Head and thorax brown, face suffused with whitish. Palpi pale brownish-ochreous, anterior edge dark fuscous, terminal joint longer than second. Antennæ fuscous, towards apex irregularly dotted with ochreous-white. Abdomen dark fuscous. Forewings elongate, very narrow, long-pointed, apex obtuse ; 6 separate ; brown, more or less suffused irregularly with dark fuscous ; a small oval white spot beneath fold at ⅖, and an oblique linear white mark beneath costa at ⅖ ; a few scattered white scales in middle of disc ; an irregular, sometimes interrupted white line from ⅘ of costa to before tornus, double on median third and enclosing a blackish mark ; some whitish dots along termen : cilia dark grey, at apex with outer half brownish-ochreous, beneath apex with brownish-ochreous bars on basal half. Hindwings ¾, cilia 3 ; dark fuscous, thinly scaled anteriorly ; cilia purplish-grey.

Khasi Hills, from September to November ; four specimens.

Aristotelia brochodesma, n. sp.

♂ ♀. 8-9 mm. Head light brownish, face glossy pale whitish-ochreous. Palpi light greyish-ochreous, anterior edge dark fuscous, apex of second joint ochreous-whitish, terminal joint longer than second. Antennæ ochreous-whitish ringed with blackish. Thorax brown. Abdomen dark fuscous. Forewings elongate, very narrow, long-pointed, apex obtuse ; 6 separate ; brown ; a slender angulated white fascia at ⅕, preceded by spots of blackish suffusion on costa and below middle, and followed below middle by an elongate blackish mark terminated by a whitish dot, but these dark markings are sometimes merged in a general dark fuscous suffusion ; a slender or irregular oblique whitish median fascia, preceded by a blackish spot on costa and a dot above dorsum, and followed by a blackish mark beneath costa terminated by a white dot ; a slender white fascia from ¾ of costa to before tornus, central third somewhat enlarged and containing a linear oblique black mark : cilia purplish-grey, round apex pale ochreous with basal half blackish. Hindwings ½, cilia 3 ; dark fuscous, thinly scaled in disc ; cilia purplish-grey.

Khasi Hills, in September and October ; twenty specimens.

Thiotricha, Meyr.

This genus, characterised by the long antennal ciliations of ♂, and absence of veins 4 and 8 of forewings, includes ten Australian species and two from New Zealand. I have already referred to it *animosella*, Walk., and described two Indian species; I now describe fifteen more.

Thiotricha animosella, Walk.

(*Gelechia animosella*, Walk. 1022.)

Muskeliya, Ceylon; N. Coorg; Khasi Hills; in February, March, and June.

Thiotricha glenias, n. sp.

♂ ♀. 8-10 mm. Head, palpi, antennæ, thorax, and abdomen silvery-white; palpi in ♂ with expansible fringe of long fine hairs on second joint above. Forewings elongate, very narrow, parallel-sided, round-pointed; 6 and 9 out of 7; silvery-white, more or less tinged with ochreous; apical ⅖ orange-ochreous anteriorly suffused; a grey mark from dorsum before tornus, angulated inwards near dorsum, then outwardly oblique, reaching more than half across wing, a round black dot at apex, and another on termen, each preceded by a whitish dot: cilia pale whitish-ochreous, round apex with basal half orange limited by a grey line. Hindwings ½, cilia 6; whitish-grey, thinly scaled, apex tinged with orange; a blackish apical dot: cilia pale whitish-ochreous, at apex with postmedian blackish-grey dot.

Maskeliya, Ceylon, in December, January, and May; four specimens (Pole). Allied to *animosella*, but grey dorsal mark differently formed; and also characterised by the expansible fringe of palpi, which is absent in *animosella*.

Thiotricha centritis, n. sp.

♂. 11 mm. Head, palpi, antennæ, thorax, and abdomen shining ochreous-whitish; palpi with long fine expansible hairs on second joint above. Forewings elongate, very narrow, gradually attenuated posteriorly, round-pointed; 6 and 9 out of 7; shining pale whitish-ochreous; apical third ochreous-orange, anteriorly suffused; some grey suffusion on dorsum before tornus and on middle of termen; a large round black apical dot, edged with white in cilia, cilia otherwise whitish-ochreous, round apex with a grey median line. Hindwings ½, cilia 6; whitish-grey, apex slightly tinged with orange; a blackish apical dot: cilia whitish-ochreous, at apex with postmedian blackish dot.

Palni Hills (6,000 feet); one specimen (Campbell).

Thiotricha olidias, n. sp.

♂ ♀. 8—11 mm. Head, palpi, antennæ, thorax and abdomen ochreous-whitish; palpi in ♂ with short expansible hairs towards apex of terminal joint above. Forewings elongate, very narrow, gradually attenuated, round-pointed; 6 and 9 out of 7; in ♂ ochreous-whitish, in ♀ pale greyish-ochreous; apical third orange, anteriorly suffused; costal edge posteriorly blackish, marked towards apex with three irregular white or whitish dots; in ♂ sometimes grey marks along dorsum towards ¼ and middle; two blackish streaks from about tornus, acutely angulated inwards near dorsum, then very oblique outwards, reaching ⅔ across wing, separated with whitish; beyond these a whitish terminal dot, followed by a black dot connected by a line with a black apical dot: cilia pale greyish-ochreous, round apex with a blackish-grey line. Hindwings ½, cilia 6; light grey, thinly scaled, apex tinged with orange; a blackish apical dot; cilia pale greyish-ochreous, at apex with postmedian blackish dot.

Khasi Hills, from June to November; Maskeliya, Ceylon, in April (Pole); seven specimens. Very similar to *T. saulotis*, but the latter is easily distinguished by the differently shaped forewings, with well-defined prominent tornus.

Thiotricha epiclista, n. sp.

♂. 9 mm. Head, palpi, and antennæ whitish; terminal joint of palpi dark grey towards apex anteriorly, nearly twice as long as second. Thorax pale shining grey. Abdomen grey. Forewings elongate, very narrow, attenuated from near base, apex round-pointed, termen very oblique; 6 and 9 out of 7; shining dark grey; an orange patch occupying apical third of wing, not reaching margins except at apex and tornus, enclosing a wedge-shaped blackish terminal streak, and with its anterior end indented by an acute triangular projection of ground colour; a blackish streak crossing this patch from near lower anterior angle almost to apex, and a blackish longitudinal dash above this; three white dots on costa posteriorly, and a black apical dot; some indistinct whitish dots or strigulæ on dorsum posteriorly and termen: cilia grey, round apex with a darker shade. Hindwings ½, cilia 6; rather dark grey, cilia grey, at apex with a postmedian blackish dot.

Khasi Hills, in September; one specimen.

Thiotricha acrantha, n. sp.

♂. 10 mm. Head, palpi, antennæ, and thorax ochreous-whitish; second joint of palpi grey, with a few long expansible hairs at its apex above. Abdomen pale grey, anal tuft whitish-ochreous. Forewings elongate, very narrow, long-pointed, acute; 6 and 9 out of 7; shining ochreous-whitish; an acutely angulated whitish line from ⅓ of costa to tornus, edged anteriorly on upper half by a blackish streak, elsewhere indistinctly with fuscous, angle nearly reaching apex; apex faintly rosy-tinged; small blackish dots at apex and on termen towards apex: cilia pale whitish-ochreous, at apex with a grey median line; apex of wing beneath distinctly rosy-tinged. Hindwings ¾, cilia 4; light grey thinly scaled towards base; a dark grey apical dot; cilia pale greyish-ochreous, at apex with dark grey postmedian dot.

Khasi Hills, in September; one specimen.

Thiotricha characias, n. sp.

♂ ♀. 13-14 mm. Head and antennæ white. Palpi white, anterior edge of terminal joint blackish. Thorax and abdomen ochreous-grey-whitish. Forewings elongate, very narrow, parallel-sided, apex round-pointed, termen somewhat sinuate beneath apex, very oblique; 6 out of 7, 9 separate; pale greyish-ochreous; dorsum in ♂ slenderly suffused with fuscous; a slender very oblique blackish streak from near dorsum in middle, reaching ⅔ across wing; apical fourth more or less infuscated, browner towards termen; a whitish wedge-shaped mark on tornus, and dot on costa opposite; a snow-white dot before apex, partially edged with blackish, and a whitish dot on termen beneath it: cilia greyish-ochreous, round apex with two blackish lines separated with whitish. Hindwings ⅘, cilia 3; light grey, thinly scaled anteriorly; a blackish apical dot; cilia greyish-ochreous, at apex with a black postmedian bar preceded by whitish suffusion.

Palni Hills; two specimens (Campbell).

Thiotricha galactæa, n. sp.

♂ ♀. 13—15 mm. Head, palpi, antennæ, and thorax ochreous-whitish; anterior edge of terminal joint of palpi blackish. Forewings elongate, very narrow, parallel-sided, apex round-pointed, termen somewhat sinuate, very oblique; 6 out of 7, 9 separate; ochreous-whitish; two elongate blackish dots obliquely placed towards dorsum about ⅓; a very oblique blackish median streak reaching from near dorsum to above middle; a blackish longitudinal mark above dorsum towards tornus; posterior fourth of costa and termen more or less suffused with dark fuscous; a short oblique whitish streak from costa at ⅘, and a whitish streak almost along termen; a white dot before apex, partially edged with black: cilia ochreous-whitish round apex, with two blackish lines. Hindwings ⅘, cilia 3; pale grey, thinly scaled; a dark grey dot at apex; cilia pale whitish-ochreous, at apex with a black postmedian bar.

Palni Hills (6,000 feet); three specimens (Campbell).

Thiotricha hoplomacha, n. sp.

♂. 15 mm. Head, palpi, antennæ, thorax, and abdomen pale whitish-ochreous; second joint of palpi with a lateral fuscous stripe, anterior edge of terminal joint dark fuscous. Forewings elongate, very narrow, pointed; 6 out of 7, 9 separate; whitish-ochreous, markings blackish-fuscous; a thick streak along costa from base, attenuated and becoming subcostal towards middle, continued to apex; a very oblique streak from costa about ¾, running into this; a very oblique curved wedge-shaped streak from dorsum towards base, not crossing fold; a thick oblique streak from dorsum about middle, running into subcostal streak, dilated on dorsum; a streak from tornus before termen to apex, finely attenuated upwards; a blackish pale-edged apical dot: cilia whitish-ochreous, on costa pale ochreous with blackish-fuscous basal streak, round apex with median and apical fuscous lines. Hindwings ⅘, cilia 2½, pale whitish-grey; cilia whitish-ochreous, at apex with dark grey subapical line.

Khasi Hills, in September; one specimen.

Thiotricha pylartis, n. sp.

♂ ♀. 11—13 mm. Head and palpi shining white, anterior edge of terminal joint of palpi blackish. Antennæ white. Thorax whitish. Abdomen ochreous-whitish. Forewings elongate, very narrow, gradually attenuated from near base, acutely pointed, in ♂ with expansible hair pencil from base lying beneath costa; 6 separate, 9 out of 7; ochreous-whitish, markings dark slaty-grey; a slender basal fascia, sometimes interrupted; two irregular zigzag sometimes interrupted lines from costa at ⅓ and ⅔, confluent towards dorsum; inwardly oblique fasciæ at middle and ¾, first narrow, second broader, sometimes not reaching dorsum often connected by a line in disc; a small spot or bar just before apex: cilia grey. Hindwings ⅓, cilia 6; light grey, darker in ♀, thinly scaled towards base, cilia grey.

Khasi Hills, from August to December and in March; thirty specimens.

Thiotricha grammitis, n. sp.

♂♀. 10—11 mm. Head, palpi and antennæ ochreous-white. Thorax and abdomen ochreous-whitish. Forewings elongate, very narrow, apex strongly produced, acute, termen oblique; 6 separate, 9 out of 7; pale whitish-ochreous; an elongate black dot beneath costa near base; sometimes a dark fuscous dot beneath costa at ⅕; a short inwardly oblique blackish mark from costa at ⅖; disc and dorsum obscurely streaked with fuscous suffusion; a dark fuscous dot above dorsum at ⅓ and an oblique dark fuscous mark from dorsum at ⅔, both sometimes almost obsolete; four longitudinal dark fuscous lines on posterior half of wing, first and third converging to near apex, second terminating at ¾, fourth running to tornus, between third and fourth an acutely inwards angulated line running from termen to ¾ and back to termen; a silvery spot on termen beneath apex: cilia pale whitish-ochreous, on costa with a blackish basal line, at apex with two dark grey bars beyond middle, on termen with basal half ochreous-yellowish edged externally with a thick violet-silvery-metallic mark. Hindwings ⅓, cilia 3; grey, thinly scaled towards base; cilia pale greyish.

Khasi Hills, in December and March; three specimens.

Thiotricha scotaea, n. sp.

♀. 13 mm. Head and thorax bronzy-fuscous, face pale shining grey. Palpi grey-whitish. Antennæ grey. Abdomen bronzy-grey. Forewings elongate, very narrow, apex round-pointed, termen extremely obliquely rounded; 6 separate, 9 out of 7; rather dark purplish-fuscous; an oblique fuscous-whitish mark towards apex; two minute whitish dots on costa near apex; a blackish apical dot, edged posteriorly with a few whitish scales: cilia pale fuscous, on costa with a dark fuscous shade. Hindwings ¾, cilia 3; rather dark grey, thinly scaled in disc; cilia grey, at apex with a dark grey postmedian line.

Maskeliya, Ceylon, in June; one specimen (Pole).

Thiotricha rhodopa, n. sp.

♂. 11 mm. Head, palpi and antennæ ochreous-whitish, anterior edge of terminal joint of palpi finely dark fuscous. Thorax and abdomen whitish-ochreous. Forewings elongate, very narrow, gradually narrowed from near base, apex pointed, termen sinuate, very oblique; 6 and 9 apparently separate; whitish-ochreous; base of costa slenderly blackish; a dark fuscous streak at first thick but rapidly attenuated rising from dorsum near base and running in a curve near costa to disc at ⅘ and a similar less curved streak from middle of dorsum, posteriorly coincident with first; between and beyond these dorsal half of wing is mainly occupied by two white blotches; an acutely inwards angulated dark fuscous mark above tornus, and a longitudinal mark beneath costa opposite it; apical area beyond these mostly suffused with white, with a black dot beneath apex : cilia whitish, towards tornus suffused with whitish-ochreous, on costa with a dark fuscous basal streak edged with ochreous, beneath subapical dot with a small crimson spot followed by some silvery scales. Hindwings ¾, cilia 4 ; light grey, thinly scaled anteriorly ; cilia whitish-ochreous, at apex with a blackish-grey subapical bar.

Khasi Hills, in September ; one specimen.

Thiotricha chrysantha, n. sp.

♂. 11 mm. Head and antennæ ochreous-whitish. Palpi yellowish, anterior edge of terminal joint dark fuscous. Thorax orange-ochreous. Abdomen blackish-grey. Forewings elongate, very narrow, gradually narrowed from near base, apex pointed, termen somewhat sinuate, very oblique ; 6 and 9 apparently separate ; deep ochreous-yellow, suffused with orange-red on margins of dark markings ; two pairs of very oblique dark fuscous streaks from costa and dorsum near base and before middle respectively, each pair meeting at a very acute angle, first connected with second in disc by dark fuscous suffusion, angle of second extended as a blackish line to termen beneath apex ; two white dorsal blotches between and beyond these streaks respectively, second followed by a dot of dark fuscous suffusion ; an oblique blackish wedgeshaped mark from costa at ¾, edged with pink : cilia dark grey, on costa ochreous-yellowish with a black basal line, on termen with basal half light crimson edged with pale golden-metallic. Hindwings ¾, cilia 4 ; blackish-grey, thinly scaled towards base ; cilia blackish-grey.

Khasi Hills, in June ; one specimen.

Thiotricha pteropis, n. sp.

♀. 8—10 mm. Head, palpi, antennæ, thorax, and abdomen pale whitish-ochreous. Forewings elongate, narrow, costa posteriorly slightly arched, apex much produced, pointed, termen sinuate, very oblique ; 6 and 9 separate ; ochreous-white or whitish-ochreous ; an elongate rounded-triangular leaden-grey spot finely edged with blackish extending along termen from tornus to apex, broadest anteriorly ; an oblique blackish line from ¾ of costa running into this before apex ; a small triangular ochreous-brown costal mark before apex, meeting apex of terminal spot ; a round black apical dot : cilia light greyish, beneath apex orange at base, round apex with two short blackish lines. Hindwings ½, cilia 5 ; grey ; cilia light greyish.

Khasi Hills, in July and September ; Maskeliya, Ceylon, in March (Pole) three specimens.

Thiotricha galenæa, n. sp.

♀. 16 mm. Head, palpi, antennæ, and thorax shining ochreous-white, anterior edge of terminal joint of palpi grey. Abdomen ochreous-whitish. Forewings elongate, very narrow, apex obtuse, termen very obliquely rounded ; 6 and 9 separate ; shining ochreous-white ; an indistinct grey very acutely angulated transverse line about ¾, not reaching either margin ; some grey suffusion towards termen ; a white almost marginal line along posterior part of costa and termen, at apex preceded by an orange dot and followed by a black dot, whence proceeds a blackish line along upper part of termen : cilia whitish-ochreous. Hindwings ⅘, cilia 2½ ; whitish-grey, towards apex whitish-ochreous : a blackish apical dot ; cilia whitish-ochreous, at apex with a blackish median bar.

Maskeliya, Ceylon, in February ; two specimens (Pole).

Timyra isochra, n. sp.

♂. 12—14 mm. Head, palpi, thorax, and abdomen whitish-ochreous; second joint of palpi dilated towards apex and rough-scaled beneath, internally excavated and filled with blackish scales, terminal joint minute, concealed ; thorax partly suffused with deeper ochreous. Antennæ ochreous-yellowish, basal joint with anterior scale-projection. Legs whitish-ochreous, anterior and middle tibiæ with a grey spot, posterior tibiæ and basal joint of tarsi clothed with long rough projecting ochreous-whitish hairs, mixed with dark fuscous, with a tuft of blackish metallic-tipped scales towards apex of tibiæ. Forewings elongate, narrow, costa moderately arched, apex round-pointed, termen extremely obliquely rounded ; 4 and 5 stalked, 7 to costa, 9 connate with 7 ; light ochreous-yellowish ; four somewhat oblique rather broad undefined fasciæ of deeper ochreous or brownish suffusion, first sometimes rather dark fuscous, second narrowest : cilia whitish-ochreous. Hindwings with 3 absent, 6 to costa ; light ochreous-yellowish, with subdorsal groove enclosing long pencil of ochreous-yellowish hairs ; cilia whitish-ochreous.

Maskeliya, Wellawaya, and Puttalam, Ceylon, in May, November and December ; five specimens (Pole, Alston).

Timyra phorcis, n. sp.

♀. 13—14 mm. Head fuscous, face whitish. Palpi whitish, anterior edge dark fuscous. Antennæ whitish. Thorax rather dark fuscous, posterior extremity whitish. Abdomen whitish-ochreous. Legs light ochreous ringed with whitish, posterior tibiæ clothed above with very long projecting curved whitish hairs mixed with blackish. Forewings elongate, rather narrow, costa moderately arched, apex obtuse, termen slightly rounded, oblique ; 7 to apex ; ochreous-whitish ; a narrow dark fuscous basal fascia ; a very broad rather dark purplish-fuscous antemedian fascia, considerably narrowed towards costa ; an ill-defined triangular spot of dark fuscous irroration on costa beyond middle, and a sub-triangular dark fuscous spot on tornus, connected anteriorly by a pale ochreous-yellowish streak, the fascia of ground colour which precedes these bisected by an undefined line of dark fuscous scales ; apical area between and beyond these irregularly strewn with dark fuscous scales : cilia ochreous-whitish base mixed with fuscous. Hindwings with 6 to termen ; grey, lighter towards base ; cilia ochreous-grey-whitish.

Puttalam, Ceylon, from September to November ; three specimens (Pole).

Timyra pastas, n. sp.

♂ ♀. 19—23 mm. Head whitish-ochreous, tinged on crown and sometimes mixed with bronzy-fuscous, sides more yellowish. Palpi whitish-ochreous, second joint in ♂ internally with long expansible whitish-ochreous scales, terminal joint long, slender, basal and terminal joints tinged with fuscous. Antennæ ochreous-yellowish, towards apex ringed with fuscous, basal joint simple. Thorax whitish-ochreous mixed with dark fuscous. Abdomen pale ochreous-yellowish, segments suffused with fuscous towards base, apex deeper yellow. Legs dark fuscous, banded with pale yellowish, posterior tibiæ and tarsi clothed above with rough dark fuscous hairs irrorated with whitish, with very large expanded median tuft of whitish, ochreous-yellow, black, and bright steel-metallic scales. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen slightly rounded, oblique; 7 to apex; whitish-ochreous-yellowish irregularly sprinkled with blackish and dark fuscous; a small blackish basal spot; a broad suffused dark fuscous antemedian fascia; a broad suffused fascia of dark fuscous and black irroration occupying apical fourth of wing: cilia bronzy-grey, basal half deep ochreous-yellow limited by a dark fuscous shade. Hindwings with 3 in ♂ absent, 6 to termen; dark fuscous, in ♂ with a short subdorsal groove, beneath which is a short fringe of whitish-ochreous hairs; cilia bronzy-grey, basal third pale ochreous-yellowish.

N. Coorg (3,500 feet), in May, September and October; five specimens (Newcome).

Timyra autarcha, n. sp.

♂ ♀. 18—19 mm. Head ochreous-yellow. Palpi light ochreous-yellow, basal joint fuscous, terminal joint long, slender, anterior edge dark fuscous. Antennæ whitish-ochreous ringed with dark fuscous, basal joint simple. Thorax blackish. Abdomen ochreous-yellow; segments rather dark fuscous towards base. Legs dark fuscous, femora and tarsi banded with pale ochreous-yellowish, posterior tibiæ and tarsi clothed above with rough dark fuscous hairs, tufted in middle of tibiæ, with an ochreous-whitish band before middle. Forewings elongate, rather narrow, posteriorly somewhat dilated, costa posteriorly moderately arched, apex rounded, termen obliquely rounded; 7 to apex; whitish-ochreous; three blackish fasciæ, first narrow, basal extended along costa to meet second, second broad, antemedian, third very broad, from about ⅔ of costa to tornus, with a few ochreous-whitish specks, posterior edge curved parallel to margin of wing; a deep ochreous-yellow streak along posterior part of costa and termen: cilia dark bronzy-grey, with blackish basal line. Hindwings with 3 in ♂ absent, 6 to termen; dark fuscous: cilia bronzy-grey, with pale basal line and darker subbasal shade.

Palni Hills (6,000 feet): N. Coorg (3,500 feet); in May, two specimens (Campbell, Newcome).

Timyra stachyophora, n. sp.

♂. 18—19 mm. Head whitish-ochreous. Palpi whitish-ochreous, basal joint fuscous, second joint very long, clothed internally and above with very long expansible ochreous-whitish hairs, terminal joint about half second, clothed with dense hairs above, mixed or suffused with dark fuscous. Antennæ dark grey, basal joint with large tuft of whitish-ochreous scales becoming dark grey towards apex, internally blackish. Thorax fuscous. Abdomen whitish-ochreous, dorsally more yellowish, with slight fuscous suffusion. Legs dark fuscous ringed with ochreous-whitish, posterior tibiæ with very large median tuft of long curved pale yellowish scales mixed with blackish. Forewings elongate, narrow, costa gently arched, apex obtuse, termen slightly rounded, oblique ; 7 to apex ; whitish-ochreous, irregularly mixed with fuscous and sprinkled with blackish ; a slender dark fuscous basal fascia, followed by a narrow clear whitish-ochreous fascia ; a curved slightly oblique clear whitish-ochreous transverse median line ; an irregular dark fuscous line round apex and termen : cilia whitish-ochreous, with dark fuscous antemedian and fuscous apical shades. Hindwings with 3 absent, 6 to termen ; whitish-ochreous ; a narrow fuscous streak along termen, sometimes interrupted, and a fuscous patch along posterior half of costa ; submedian and subdorsal grooves suffused with light ochreous-yellowish, latter with a very long expansible pencil of whitish-ochreous hairs ; cilia whitish-ochreous, with faint fuscous line.

Diyatalawa (4,000 feet), Ceylon, in August and September (Fletcher) ; three specimens.

Timyra holocona, n. sp.

♂. 16—18 mm. Head dark fuscous, sides yellowish. Palpi dark fuscous, externally suffused with pale yellowish, second joint much thickened with dense projecting scales above and beneath, terminal joint very short, concealed. Antennæ pale yellowish, basal joint dark fuscous, with anterior scale-projection. Thorax dark fuscous, with angulated posterior ochreous-yellow mark. Abdomen dark fuscous, beneath whitish-ochreous. Legs whitish-ochreous banded with dark fuscous, posterior tibiæ with expansible median tuft of whitish-ochreous hairs becoming dark fuscous on upper half, basal joint of tarsi rough-scaled above. Forewings elongate, narrow, costa anteriorly moderately arched, apex obtuse, termen obliquely rounded ; 4 and 5 stalked, 7 to costa ; dark fuscous, faintly purplish-tinged ; a yellowish basal dot ; two irregular inwardly oblique pale yellowish transverse lines before and beyond ¼ ; a triangular ochreous-yellow blotch on costa beyond middle, reaching more than half across wing, and a yellow dot in disc beyond apex of this : cilia dark fuscous. Hindwings with 3 absent, 6 to apex, dark fuscous, a submedian groove containing an expansible pencil of very long whitish-ochreous hairs ; cilia dark fuscous.

Maskeliya, Ceylon, in August, two specimens (de Mowbray).

Timyra dipsalea, n. sp.

♂. 17—19 mm. Head orange, lower part of face infuscated. Palpi fuscous, much thickened throughout with dense projecting scales beneath, second joint internally with long expansible pale greyish-ochreous hairs, terminal joint shorter than second, wholly clothed with dense scales. Antennæ about 1, dark fuscous, basal joint with projecting scales anteriorly. Thorax fuscous, darker anteriorly. Abdomen pale ochreous-yellowish. Legs fuscous, anterior pair dark fuscous, streaked and dotted with white, posterior tibiæ with large median tuft of curved ochreous-whitish scales becoming blackish and steel-metallic on upper half, basal joint of tarsi rough-scaled above. Forewings elongate, rather narrow, posteriorly dilated, costa gently arched, apex rounded, termen obliquely rounded; 7 to apex; fuscous, irrorated with fuscous-whitish scales tipped with blackish; a suffused whitish-ochreous streak along dorsum; some raised scales in disc near base: cilia greyish or grey-whitish, with a dark fuscous subbasal line, base ochreous-tinged. Hindwings with 3 absent, 6 to termen; whitish-ochreous, towards apex tinged with fuscous; a subdorsal groove containing an expansible pencil of very long pale ochreous-yellowish hairs; cilia whitish-ochreous.

Khasi Hills, in June; five specimens. In this species the antennæ are shorter than usual, being only about as long as forewings, whereas in general they are very obviously longer, but otherwise there seems no structural difference.

Timyra stasiotica, n. sp.

♂ ♀. 24—28 mm. Head pale ochreous mixed with fuscous. Palpi in ♂ fuscous, basal joint elongate forming an elbow, second joint very long, much thickened with dense scales, internally with very long expansible pencil of whitish-ochreous hairs, terminal joint about half second, much thickened with dense scales, obtuse, in ♀ pale ochreous-yellowish mixed with fuscous and dark fuscous. Antennæ ochreous-yellowish, ringed and sometimes mixed with fuscous, basal joint in ♂ with large curved anterior tuft of shining dark fuscous scales. Thorax ochreous-fuscous mixed with dark fuscous. Abdomen pale ochreous-yellowish, with dark fuscous lateral line. Legs dark fuscous banded with pale yellowish, apex of middle tibiæ white in ♂, posterior tibiæ with very large median tuft of curved yellowish and fuscous scales becoming blackish and shining bronzy towards apex. Forewings elongate, narrow, rather dilated posteriorly, costa slightly arched, apex obtuse, termen rather obliquely rounded; 7 to termen; fuscous or whitish-fuscous, irrorated with dark fuscous, sometimes sprinkled with whitish or deep ochreous; in ♂ a tuft of raised scales in disc near base; an indistinct rather oblique sometimes curved slender deep yellow-ochreous fascia from ⅗ of costa to ¾ of dorsum, often incomplete or reduced to a small discal spot: cilia ochreous-whitish, becoming yellowish towards base, with dark fuscous subbasal shade, and two posterior fuscous shades. Hindwings with 3 in ♂ absent, 6 to termen; whitish-ochreous-yellowish; costa and termen narrowly suffused throughout with fuscous, in ♂ more widely towards apex; in ♂ a submedian groove containing an expansible pencil of very long ochreous-whitish hairs; cilia whitish-ochreous-yellowish.

Maskeliya, Ceylon, in April, May and August; five specimens (Green, Pole, de Mowbray). Might be mistaken for a dark form of *T. cingalensis*, but certainly distinct by narrower forewings and obtuse palpi of ♂; fascia of forewings differently placed, and in *cingalensis* always distinct.

Timyra aulonitis, n. sp.

♂ ♀. 17—19 mm. Head whitish-ochreous, crown suffused with fuscous except on sides. Palpi ochreous-whitish, in ♂ much thickened throughout with dense scales, second joint internally with very large expansible tuft of long whitish hairs mixed basally with black, terminal joint shorter than second, obtuse, internally excavated and filled with black scales; in ♀ with terminal joint and anterior edge of second blackish. Antennæ ochreous-whitish ringed with dark fuscous, basal joint in ♂ with large anterior scale-projection. Thorax rather dark fuscous, with ochreous-whitish stripe on each side of back. Abdomen whitish-ochreous dorsally suffused with fuscous towards base. Legs ochreous-whitish banded with dark fuscous, posterior tibiæ and tarsi above with short rough orange scales mixed with black, and long scattered whitish and black scales, forming a tuft before middle of tibiæ. Forewings elongate, narrow, costa slightly arched, apex obtuse, termen nearly straight, rather strongly oblique; 7 to termen, 9 out of 7; dark fuscous; all veins marked by ochreous-whitish lines, sometimes partially tinged with ochreous-yellow; costal edge pale ochreous-yellowish: cilia whitish-ochreous, base more yellowish, with two dark fuscous shades. Hindwings with 3 absent in ♂, 6 to termen; grey, in ♂ with broad whitish-ochreous patch extending through disc from near base to near termen, beneath which is a groove containing pencil of whitish-ochreous hairs; cilia whitish-ochreous, with two indistinct fuscous shades except on upper portion of termen.

Kandy and Peradeniya, Ceylon, in August, October and February: five specimens (Green).

Timyra xanthaula, n. sp.

♂. 19—22 mm. Head palpi, antennæ, thorax and abdomen ochreous-yellowish; centre of crown tinged with fuscous; palpi alike in both sexes; anterior edge dark fuscous; antennæ with a dark fuscous line on basal joint; shoulders with a fuscous spot. Legs whitish-ochreous banded with blackish-grey, posterior tibiæ and basal joint of tarsi orange with a black lateral line, above clothed with rough yellowish hairs mixed with black, with a large median tuft of yellowish hairs tipped with black. Forewings elongate, narrow, costa gently arched, apex obtuse, termen nearly straight, oblique; 7 to termen; ochreous-yellowish, deeper on margins; a moderate somewhat oblique deep ochreous-yellow median fascia, with traces of fuscous edging; two fuscous longitudinal lines in disc before this, coincident towards base, and onealong fold not reaching fascia; a series of interneural fuscous streaks on posterior half of wing: cilia whitish-ochreous with a black subapical line, basal half deep ochreous-yellow. Hindwings with 3 absent, 6 to termen; whitish-ochreous; submedian and subdorsal grooves, latter containing expansible whitish-ochreous hairs; cilia whitish-ochreous.

Palni Hills (6,000 feet); three specimens (Campbell).

Timyra schœnota, n. sp.

♂ ♀. 24—27 mm. Head orange-yellow, centre of crown bronzy. Palpi alike in both sexes, orange-yellow, anterior edge black, terminal joint in ♀ almost wholly blackish. Antennæ ochreous-yellowish, anteriorly suffused with fuscous, in ♀ ringed with fuscous, basal joint in ♂ with large anterior tuft of curved yellowish scales mixed with dark grey. Thorax dark fuscous, with ochreous-yellow stripe on each side of back. Abdomen orange-yellow, towards base suffused with fuscous. Legs orange-yellow banded with dark fuscous, posterior tibiæ and tarsi above with rough black scales and longer scattered pale yellowish hairs with black tips, tibiæ with large median tuft of similar hairs. Forewings elongate, narrow, costa gently arched apex obtuse, termen slightly rounded, oblique ; 7 to termen ; in ♂ ochreous-orange, in ♀ pale ochreous-yellowish streaked with orange , a costal streak from base to $\frac{3}{5}$ and a series of well-marked interneural streaks, not reaching costa posteriorly or termen, blackish or dark fuscous, interrupted by a somewhat curved oblique double median fascia, of which first half is ochreous-yellow, paler in ♀, and second deep ochreous-orange suffusedly edged with dark fuscous ; a blackish line along posterior part of costa and termen : cilia pale whitish-ochreous, basal half orange, with a blackish postmedian line becoming double towards tornus. Hindwings with 3 in ♂ absent, 6 to termen ; dark fuscous ; in ♂ an ochreous-yellow streak from base along a subdorsal groove enclosing a pencil of long ochreous-whitish hairs, posteriorly dilated into a broad patch extending all along termen but not quite reaching it, in which is a curved line of appressed hairs ; cilia ochreous-whitish, more yellowish towards base, with two dark fuscous shades.

Palni Hills and Cuddapah ; three specimens (Campbell).

Timyra toxastis, n. sp.

♀. 17—20 mm. Head fuscous, face and side-tufts ochreous-whitish. Palpi ochreous-whitish, anterior edge and terminal joint dark fuscous. Antennæ fuscous-whitish, more or less suffused with fuscous and ringed with dark fuscous. Thorax bronzy-fuscous, with slender whitish stripe on each side of back. Abdomen light ochreous-yellowish. Legs ochreous-yellowish longitudinally streaked with black edged with whitish, posterior tibiæ with large median tuft of long curved whitish and black hairs. Forewings elongate, narrow, costa slightly arched, apex obtuse, termen slightly rounded, rather oblique ; 7 to termen ; brown sprinkled with dark fuscous, narrow orange subcostal and submedian streaks from base, not reaching middle ; a slender curved rather oblique white median fascia ; veins on posterior third of wing marked with irregular white streaks ; a slender white streak along posterior part of costa and termen : cilia white, basal half yellowish-tinged, limited by a blackish line, tips fuscous. Hindwings with vein 6 to termen ; grey; cilia grey-whitish, base yellowish-tinged, with a subbasal fuscous line.

N. Coorg (3,500 feet), in June and November ; three specimens (Newcome).

Timyra toreutis, n. sp.

♂. 17—20 mm. Head dark bronzy-fuscous, face suffused with ochreous-whitish. Palpi simple, sickle-shaped, whitish-yellow, anterior and posterior edges blackish. Antennæ pale yellowish anteriorly suffused with dark fuscous basal joint with yellowish anterior tuft mixed with dark fuscous. Thorax dark bronzy-fuscous, with a whitish line on each side of back and a yellow mark on each side of posterior extremity. Abdomen ochreous-yellowish, base of segments suffused with dark fuscous. Legs yellowish, banded with blackish sprinkled with white, posterior tibiæ with large median tuft of long curved purplish-fuscous and ochreous-yellow scales tipped with black. Forewings elongate, narrow, costa gently arched, apex obtuse, termen slightly rounded, oblique; 7 to apex, 9 out of 7; dark fuscous; two or three short whitish streaks from base; transverse lines of white irroration at ¼ and ⅓, partly marked with orange; three orange longitudinal streaks from about middle to ¾, third furcate posteriorly, separated by streaks of purplish-leaden suffusion; veins 3, 4, and 7—10 marked more or less completely with white streaks, 5 and 6 with orange streaks; a short white streak along costa near apex: cilia fuscous-whitish, basal third pale yellowish limited by a black line with two postmedian dark fuscous lines. Hindwings with 3 absent, 6 to termen; dark fuscous, a subdorsal groove enclosing a pencil of whitish-ochreous hairs; cilia rather dark fuscous, base pale yellowish.

Maskeliya, Ceylon, from August to October; four specimens (Alston). Very like *mendicella*, but differing by the smaller size, white streaks from base (in *mendicella* orange), fewer and longer orange postmedian streaks, more numerous white and fewer orange lines on veins posteriorly, and wholly dark fuscous hindwings.

Timyra selmatias, n. sp.

♀. 18—19 mm. Head and thorax bronzy-fuscous. Palpi whitish tinged with fuscous, anterior edge dark fuscous. Antennæ white ringed with dark fuscous. Abdomen ochreous-whitish. Legs fuscous ringed with yellowish and whitish, posterior tibiæ with very long rough whitish hairs, and very large median tuft of curved yellowish and whitish hairs tipped with black and silvery-metallic, and smaller apical yellowish tuft tipped with grey and violet-whitish, basal joint of tarsi above with rough yellowish scales tipped with grey and violet-whitish. Forewings elongate, narrow, costa slightly arched, apex obtuse, termen slightly rounded, oblique; 7 to just below apex; purplish-fuscous, sprinkled with blackish; median third obscurely streaked with whitish on veins; a narrow irregular orange transverse fascia from ⅗ of costa to ¾ of dorsum; a triangular spot of whitish suffusion on costa about ⅚, and an irregular suffused whitish streak immediately before termen; apical and terminal edge suffused with dark fuscous: cilia grey-whitish, basal third pale yellowish limited by a fuscous line. Hindwings with 6 to termen; grey; cilia whitish-ochreous, more yellowish towards base.

Maskeliya, Ceylon, in August and October; two specimens (Alston).

Timyra sphaeristis, n. sp.

♂ ♀. 16—17 mm. Head and thorax shining light ochreous-yellowish, centre of crown fuscous. Palpi yellowish, alike in both sexes. Antennæ pale yellowish. Abdomen whitish-ochreous, segments dorsally suffused with fuscous. Legs whitish-ochreous, anterior and middle tibiæ yellowish with blackish subapical spots, posterior tibiæ with expansible tufts of yellowish scales at middle and apex spotted with blackish at base. Forewings elongate, narrow, costa gently arched, apex round-pointed, termen extremely obliquely rounded; 7 to termen;

ochreous-yellow; a dark fuscous basal median dot; a moderate oblique fuscous fascia from near costa at ¼ to middle of dorsum; a round fuscous blotch resting on dorsum before tornus and reaching ¾ across wing; a triangular patch of fuscous suffusion resting on termen: cilia ochreous-yellow. Hindwings with 3 present in ♂, stalked with 4, 6 to termen; pale whitish-yellowish; in ♂ basal half mostly occupied by a patch of modified brownish scales, including a long expansible pencil of brown hairs from base in a submedian groove; cilia whitish-yellowish.

Palni Hills (6,000 feet); two specimens (Campbell).

Timyra hippastis, n. sp.

♂ ♀. 10—12 mm. Head ochreous-yellowish, face whitish. Palpi whitish-yellowish, alike in both sexes. Antennæ white ringed with fuscous, basal joint simple. Thorax whitish, more or less suffused with yellow-ochreous. Abdomen in ♂ dark grey, in ♀ ochreous-whitish. Legs ochreous-whitish, posterior tibiæ and basal joint of tarsi clothed with long rough whitish scales mixed with fuscous, tibiæ with median and apical tufts tipped with black. Forewings elongate, narrow, costa slightly arched, apex round-pointed, termen extremely obliquely rounded; 5 absent, 7 to apex; in ♂ ochreous-yellow, in ♀ white more or less suffused with ochreous-yellow, especially on margins; a small deep yellow basal patch, in ♂ containing a large tuft of raised scales; broad deep ochreous-yellow or yellow-brown fasciæ before middle and about ¾, confluent on dorsum; apex deep yellow or yellow-brown: cilia pale yellowish, towards tornus more or less infuscated. Hindwings with 3 present in ♂, 6 to apex; in ♂ dark grey, with submedian streak thinly scaled and yellowish-tinged, cilia grey; in ♀ whitish, cilia yellow-whitish.

Khasi Hills, from June to September; twelve specimens.

Tingentera, Walk.

I believe this generic name should be adopted for the genus which I have hitherto called *Tipha*, Walk.

Tingentera ecliptica, n. sp.

♂. 17 mm. Head and thorax shining bronze. Palpi dark metallic leaden-grey, mixed with yellowish towards base, second joint broadly dilated with dense scales above and beneath and internally excavated so as to be spoonshaped, terminal joint concealed. Antennæ dark grey with whitish median band, basal joint with slight anterior scale-projection. Abdomen pale shining grey, anal tuft whitish-ochreous. Legs orange-yellowish, anterior femora and tibiæ dark grey, middle tibiæ with dark grey apical spot, posterior tibiæ and three basal joints of tarsi with rough projecting scales above. Forewings elongate, posteriorly dilated, costa moderately arched, apex rounded, termen obliquely rounded; lower margin of cell approximated to dorsum, 2 widely remote, 3 and 4 stalked from angle, 7 and 8 stalked, 8 to apex; dark purplish-fuscous, posteriorly broadly suffused with metallic-bronze; a deep fiery orange band occupying basal ⅖ of wing except a very small basal patch, posterior edge concave, emitting a narrow subdorsal projection to beyond middle; in middle of this band is a small leaden-metallic spot : cilia shining bronze. Hindwings with 3 and 4 approximated, 6 and 7 approximated, 7 to apex ; dark fuscous ; rather broad pale orange costal and submedian streaks of modified scales, confluent towards base, latter grooved towards base and enclosing an expansible pencil of long pale orange hairs ; cilia grey.

Kandy, Ceylon, in October ; one specimen (Green).

Tingentera thoracias, n. sp.

♂ 18—19 mm. Head and thorax shining bronze, face yellowish. Palpi bluish-leaden-metallic, second joint broadly dilated with long rough yellowish scales beneath and short ones above, and internally excavated so as to be spoonshaped, terminal joint concealed. Antennæ dark grey, with whitish median band, basal joint with slight anterior scale-projection. Abdomen light ochreous-yellowish. Legs light yellowish, anterior femora and tibiæ dark metallic grey, middle tibiæ with dark grey apical spot, posterior tibiæ and three basal joints of tarsi rough-scaled above. Forewings elongate, posteriorly dilated, costa moderately arched, apex rounded, termen obliquely rounded ; lower margin of cell approximated to dorsum, 2 remote, 3 and 4 connate from angle, 7 and 8 stalked, 8 to apex, 9 connate with 7 ; purplish-fuscous, posterior half suffused with pale metallic golden-bronze ; an orange band occupying basal third of wing except a very small dark metallic bluish-leaden basal patch, posterior edge strongly concave, produced along costa as a slender streak almost to apex ; a light blue-leaden-metallic spot in middle of this band, and its posterior edge margined in disc with a blue-leaden-metallic streak ; a small transverse-oval orange spot in disc at $\frac{2}{3}$, sometimes connected with dorsum by a patch of light yellowish suffusion almost confluent dorsally with preceding band : cilia whitish-bronzy-ochreous. Hindwings with 3 and 4 approximated, 6 and 7 approximated, 7 to apex ; whitish-ochreous, with a rather broad pale orange costal streak of modified scales ; a submedian groove containing an expansible pencil of very long pale orange hairs ; cilia whitish-ochreous, slightly purplish-tinged on lower half of termen.

Maskeliya, Ceylon, in February and March ; two specimens (de Mowbray).

Tingentera philodoxa, n. sp.

♂ 20 mm. Head violet-bronzy, sides orange, upper part of face bluish-silvery, lower light orange. Palpi orange, with a dark leaden-metallic streak on upper half, second joint much dilated with dense long orange scales beneath and short ones above, terminal joint concealed. Antennæ dark fuscous, basal joint simple. Thorax dark fuscous, with an orange stripe on each side of back. Abdomen dark fuscous, apex yellowish. Legs orange-yellowish, anterior femora and tibiæ dark fuscous streaked with leaden-metallic, middle tibiæ with base and apex dark leaden-fuscous, tarsi whitish, posterior tibiæ rough-scaled, tarsi whitish banded with dark fuscous. Forewings elongate, very narrow, costa posteriorly moderately arched, apex obtuse, termen very obliquely rounded ; lower margin of cell approximated to dorsum, 2 from before middle, 3 and 4 connate from angle, 7 and 8 stalked, 7 to termen orange posteriorly mixed with dark purplish-fuscous suffusion; a narrow dark blue-leaden-metallic streak from base of costa to disc at ⅓, thence bent downwards and irregularly thickened to dorsum before tornus; a dark purplish-fuscous streak along dorsum from near base, containing a leaden-metallic streak, running into this posteriorly; a triangular suffused dark purplish-fuscous patch in disc beyond ⅔, confluent beneath with these streaks; termen suffused with deep bronzy-purple: cilia dark purplish-bronze. Hindwings with cell very short, 3 and 4 stalked, 5 bent near origin, 6 and 7 stalked, 6 to termen; blackish-fuscous; cilia dark grey.

Maskeliya, Ceylon, in April; one specimen (Pole).

Tingentera conotoma, n. sp.

♂ ♀. 14—17 mm. Head dark shining purple-bronze. Palpi alike in both sexes, ochreous-yellow. Antennæ grey, basal joint simple, yellowish. Thorax orange, large humeral blotches and a posterior spot dark shining leaden-grey. Abdomen in ♂ ochreous-yellowish, in ♀ dark grey. Legs orange-yellowish, spotted with grey suffusion, posterior tibiæ and basal joint of tarsi rough-haired above. Forewings elongate, very narrow, costa gently arched, apex round-pointed, termen extremely obliquely rounded; 2 remote, 3 and 4 connate, 7 absent, 8 to costa; orange; a small dark purplish-leaden fuscous basal-patch; two large oval bluish-leaden-metallic spots in disc, first towards costa before middle, second towards dorsum beyond middle; a dark purplish-leaden-fuscous elongate semi-oval blotch extending along dorsum from near basal patch to middle; a bronzy patch, anteriorly edged with dark fuscous suffusion, occupying apical ⅖ of wing except a narrow streak of ground colour along costa almost to apex, anterior edge acutely indented in middle: cilia bronzy, towards tornus pale greyish-ochreous. Hindwings with 3 and 4 connate, 6 and 7 stalked, 6 to termen; in ♂ whitish-ochreous, posteriorly suffused with light grey, with a submedian groove containing an expansible pencil of very long whitish-yellowish hairs; in ♀ grey; cilia whitish-ochreous, in ♀ greyish-tinged.

Maskeliya, Kandy, Maturatta, Diyatalawa, Ceylon, from January to April, in July and September; eight specimens (Pole, Green, Fletcher).

Tingentera basanistis, n. sp.

♂ ♀. 14—17 mm. Head and thorax light ochreous-yellow, shoulders with a dark leaden-fuscous spot. Palpi yellowish, in ♂ with second joint dark leaden-metallic-grey except on edges, dilated with projecting scales above and beneath and internally excavated so as to be spoonshaped, terminal joint obsolete. Antennæ pale ochreous-yellowish. Abdomen whitish-ochreous, in ♀ greyish-tinged posteriorly. Legs ochreous-yellowish, posterior tibiæ smooth, banded with dark fuscous and leaden-metallic. Forewings elongate, narrow, costa moderately arched, apex round-pointed, termen extremely obliquely rounded; 2 remote, 3 and 4 approximated from angle 7 absent, 8 to costa: orange, paler towards costa; markings dark-metallic-leaden-grey; a narrow basal spot; a streak along fold from near base to near middle; a streak in disc from about ⅓ to ⅔; a small dorsal spot before middle; apical third of wing more or less broadly streaked with leaden-grey between veins, variable in extent: cilia pale ochreous-yellowish. Hindwings with 3 and 4 connate, 6 and 7 stalked, 6 to termen; in ♂ whitish-ochreous, costa suffused with grey, with submedian groove and expansible pencil of long whitish-ochreous hairs from base lying beneath it; in ♀ grey; cilia whitish-ochreous.

Maskeliya, Ceylon, in June, from September to November, and in January; six specimens (Pole, de Mowbray).

Tingentera ephestris, n. sp.

♂. 16—18 mm. Head, palpi, and antennæ ochreous-yellow, face paler; second joint of palpi dilated with rough scales towards apex above and beneath, with a dark grey spot internally, terminal joint very short, projecting. Thorax ochreous-yellow spotted with dark fuscous. Abdomen whitish-ochreous tinged with grey. Legs yellowish, spotted with dark grey, posterior tibiæ above with expansible yellow median and apical scales tipped with black. Forewings elongate, narrow, costa gently arched, apex tolerably pointed, termen very obliquely rounded; 4 and 5 stalked, 7 and 8 stalked, 7 to costa; orange; a blackish dot on base of costa; a fascia near base composed of two irregular dark fuscous lines mixed with leaden-metallic coincident at extremities; a similar irregular transverse line at ¼, closely followed by a moderate dark fuscous fascia, narrowed on costa and dilated on dorsum; a round dark fuscous dot mixed with leaden-metallic in middle of disc; a moderate inwards-curved fascia of fuscous suffusion from about ¾ of costa to tornus, marked with a strongly inwards-oblique leaden-metallic streak from costa, a dot below middle, and a longitudinal mark on tornus; three similar longitudinal leaden-metallic marks on termen, and one on costa before apex, more or less surrounded with fuscous suffusion: cilia fuscous, basal half orange except towards tornus. Hindwings with 3 and 4 connate, 6 and 7 stalked, 6 to termen; rather dark grey; a small whitish-ochreous patch at tornus, above which is a hyaline groove containing a pencil of whitish-ochreous hairs; cilia grey.

Maskeliya, Ceylon, in February; two specimens (Pole).

Tingentera molybdantha, n. sp.

♂. 14 mm. Head dark bronzy-fuscous, face and side tufts yellowish-tinged. Palpi ochreous-yellowish mixed with dark grey, second joint broadly dilated with long projecting ochreous-yellow scales beneath, terminal joint minute, concealed. Antennæ dark fuscous, basal joint with slight anterior scale-projection. Thorax dark bronzy-fuscous. (Abdomen broken.) Legs dark fuscous, ringed with ochreous-yellowish, all femora suffused with metallic grey, posterior tibiæ with bright leaden-metallic bands before and beyond middle, with expanded scales at origin of spurs. Forewings elongate, rather narrow, costa moderately arched, apex round-pointed, termen very obliquely rounded; 2 remote, 3 and 4 connate, 7 and 8 stalked, 7 to costa; dark fuscous sprinkled with black, with scattered ochreous hair-scales; thick bluish-leaden-metallic subcostal and narrower submedian streaks from base to ⅙; an almost straight double antemedian fascia, first half narrow, yellow-ochreous, edged posteriorly with dark fuscous, second half broader, bright bluish-leaden-metallic; some irregular leaden-metallic spots in disc about ⅔ and round posterior third of costa and termen, round apex confluent into a streak: cilia rather dark fuscous, towards base mixed with ochreous. Hindwings with 3 and 4 connate, 6 and 7 stalked, 6 to termen; dark fuscous; a short subdorsal groove from base, containing an expansible pencil of whitish-ochreous hairs; cilia rather dark fuscous.

Pattipola (6,200 feet), Ceylon, in September; one specimen (Fletcher).

Tingentera merynttis, n. sp.

♂ ♀. 17—19 mm. Head light yellowish, crown suffused with prismatic bronzy-fuscous except on sides. Palpi alike in both sexes, ochreous-yellow, anterior edge of terminal joint dark fuscous. Antennæ yellowish, ringed and on apical half suffused with fuscous, in ♂ above basal joint with a short streak of shining fuscous inwardly projecting scales above. Thorax shining bronzy-fuscous. Abdomen fuscous, apex suffused with ochreous-yellow. Legs ochreous-yellow banded with dark fuscous, posterior tibiæ clothed with fine loose hairs Forewings elongate, narrow, costa gently arched, apex round-pointed, termen extremely obliquely rounded; 2 remote, 7 and 8 stalked, 7 to termen; bronzy-fuscous with bluish-leaden reflections; basal third irregularly streaked longitudinally with yellowish, with dark shining purplish-fuscous costal and purple-blackish subcostal streaks, and lines of blackish scales between the yellowish streaks; a slender oblique pale yellowish median fascia, yellower posteriorly; posterior half of wing streaked with ochreous-yellowish on veins, interspaces shining leaden-metallic: cilia pale yellowish, outer half light shining bronzy-fuscous. Hindwings with 3 and 4 connate, 6 and 7 stalked, 6 to termen; grey, in ♂ broadly suffused with whitish-ochreous-yellowish in disc, with submedian groove containing expansible pencil of long pale yellowish hairs; cilia whitish-ochreous-yellowish.

Nilgiri Hills (6,000 feet), in May; nine specimens (Andrewes).

Autosticha, Meyr.

I have recognised that this genus, based on a Hawaiian species, is identical with *Epicœnia*, Meyr, and the latter name is therefore superseded. I have described three species from Ceylon, and if I have correctly identified *Gelechia affixella*, Walk., 632, and *Gelechia strenuella*, Walk., 632, they also belong to this genus, but the condition of the original types leaves some uncertainty. I now add eleven more; but it seems desirable to repeat that considerable care is requisite in identifying the more obscure and similar species. The larvæ of several are known, and all feed in the same way in galleries on lichens.

Autosticha aureolata, n. sp.

♂. 14—15 mm. Head orange, centre of crown suffused with fuscous. Palpi orange-yellowish, anterior edge suffused with dark fuscous throughout. Antennæ dark fuscous, with whorls of long cilia (8). Thorax purplish-fuscous irrorated with dark fuscous, sides of posterior extremity yellowish. Abdomen yellowish-fuscous, segmental margins darker fuscous. Forewings elongate, costa gently arched, apex obtuse, termen nearly straight, oblique; purplish-fuscous irrorated with dark fuscous, more or less mixed with ochreous-brownish; stigmata very indistinct, dark fuscous, plical almost beneath first discal; cilia fuscous, base irrorated with dark fuscous. Hindwings dark grey; cilia grey.

Maskeliya, Ceylon, in December and May; two specimens (Pole). The long antennal ciliations are a peculiar feature, but the other structure is quite as usual.

Autosticha binaria, n. sp.

♂. 13 mm. Head orange, centre of crown suffused with fuscous. Palpi orange-yellowish, anterior edge of terminal joint dark fuscous. Antennæ dark fuscous, simple. Thorax dark fuscous, apex of patagia and two posterior marks dull orange. Abdomen dark fuscous, basal hair-tufts orange. Forewings elongate, costa slightly arched, apex obtuse, termen slightly rounded, oblique; purplish-fuscous suffusedly irrorated with dark fuscous: cilia fuscous mixed with dark fuscous. Hindwings blackish; cilia dark fuscous.

Maskeliya, Ceylon, in April; one specimen (Green). Extremely like the preceding, but the antennal difference is conclusive.

Autosticha naulychna, n. sp.

♂ ♀. 15—16 mm. Head and thorax orange-yellow. Palpi deep yellow, apex of second joint with indistinct fuscous ring. Antennæ yellowish ringed with dark fuscous. Abdomen dark grey. Forewings elongate, costa gently arched, apex obtuse, termen slightly rounded, oblique; rather dark purplish-grey; an orange-yellow basal patch, outer edge running from ⅓ of costa to ¼ of dorsum, extreme costal edge dark fuscous; a small round yellow-whitish spot in disc at ⅔: cilia purplish-grey. Hindwings and cilia rather dark grey.

Newera Eliya and Pattipola, Ceylon, in October; two specimens (Alston, Pole).

Autosticha calceata, n. sp.

♂ ♀. 11—15 mm. Head white, more or less sprinkled with grey. Palpi white, lower half and a subapical ring of second joint, and two rings of terminal joint fuscous irrorated with black. Antennæ grey. Thorax white, more or less sprinkled with fuscous, with a few black specks. Abdomen whitish sprinkled with pale fuscous. Forewings elongate, rather narrow, costa moderately arched, apex round-pointed, termen very obliquely rounded; white, sometimes partially fuscous-tinged, more or less sprinkled with fuscous and a few blackish scales; small blackish spots on costa at base, ¼, and middle, and an almost marginal series extending round posterior part of costa and termen to dorsum before tornus; stigmata large, blackish, plical obliquely beyond first discal; additional blackish dots beneath costa near base, and between median costal and second discal stigma: cilia pale whitish-ochreous, base with a few blackish specks. Hindwings pale grey; cilia ochreous-whitish.

Maskeliya, Ceylon, in January, April, and June; three specimens (Pole).

Autosticha pelœa, n. sp.

♂. 10—11 mm. Head and thorax deep ochreous-yellow, shoulders and a dot on each side of posterior, extremity of thorax black. Palpi ochreous-yellow, second joint more or less irrorated with blackish, with a black subapical ring, terminal joint with a black median band. Antennæ fuscous, obscurely paler-ringed. Abdomen grey, apex ochreous-whitish. Forewings elongate, narrow, costa moderately arched, apex round-pointed, termen extremely obliquely rounded ; deep ochreous yellow, with a few scattered black scales ; small blackish dots at base of costa and dorsum ; elongate blackish spots on costa about ⅓ and middle ; stigmata large, blackish, plical rather obliquely before first discal, preceded by more or less black suffusion on fold ; an almost marginal row of blackish dots round posterior part of costa and termen to dorsum before tornus : cilia ochreous-yellow, basal half with a few blackish specks. Hindwings grey ; cilia pale grey.

Maskeliya, Ceylon, in March and April ; three specimens (Pole).

Autosticha aspasta, n. sp.

♂ ♀. 14—16 mm. Head and thorax deep ochreous-yellow. Palpi ochreous-yellow, a subapical ring of second joint and median band of terminal joint dark fuscous. Antennæ ochreous-yellow spotted with fuscous Abdomen greyish-ochreous, margins of segments grey, apex whitish-ochreous. Forewings elongate, costa moderately arched, apex round-pointed, termen faintly sinuate, rather strongly oblique ; clear deep ochreous-yellow ; blackish dots on base of costa and dorsum ; stigmata large, black, plical rather obliquely before first discal ; an almost marginal row of large black dots along posterior third of costa and termen to dorsum before tornus : cilia ochreous-yellow. Hindwings grey ; cilia light grey, round apex tinged with yellow-whitish on outer half.

Maskeliya, Ceylon, in August ; two specimens (de Mowbray, Pole).

Autosticha demetrias, n. sp.

♂ ♀. 13—16 mm. Head and thorax ochreous-yellow or yellow-ochreous, sometimes tinged with fuscous or sprinkled with dark fuscous above. Palpi ochreous-yellowish, second joint more or less suffused with dark fuscous, sometimes on subapical ring only, terminal joint with dark fuscous median band Antennæ yellowish ringed with fuscous. Abdomen grey, segmental margins whitish-ochreous. Forewings elongate, costa moderately arched, apex obtuse, termen faintly sinuate, oblique ; deep ochreous-yellow or yellow-ochreous, with some scattered blackish scales, sometimes considerably mixed and suffused with brown ; a blackish dot on base of costa ; stigmata moderate, blackish, plical somewhat obliquely before first discal ; a short rather inwardly oblique blackish streak from dorsum beneath second discal ; an almost marginal row of blackish dots, sometimes rather large, along posterior half of costa and termen : cilia ochreous-yellow, sometimes with some dark fuscous specks on basal half. Hindwings grey, varying in intensity ; cilia whitish-grey, sometimes yellowish-tinged, with darker subbasal shade.

Maskeliya, Ceylon, from October to April ; twelve specimens (Pole, Alston).

Autosticha protypa, n. sp.

♂ ♀. 17—20 mm. Head and thorax varying from deep ochreous-yellowish to brownish. Palpi ochreous-yellowish, second joint more or less irrorated and suffused with dark fuscous, terminal joint with anterior edge or a median band more or less dark fuscous, variable in development. Antennæ yellow-ochreous ringed with fuscous. Abdomen ochreous, sides and segmental margins greyish. Forewings elongate, costa gently arched, apex obtuse, termen slightly rounded, oblique; deep yellow-ochreous or light ochreous-brownish, sometimes sprinkled with dark fuscous; a blackish dot on base of costa; stigmata rather small, blackish, plical almost beneath first discal; a short inwardly oblique streak of fuscous suffusion from dorsum just beyond second discal; an almost marginal row of rather small blackish dots along posterior half of costa and termen to dorsum before tornus: cilia ochreous-yellowish, basal half deep ochreous-yellow, sometimes sprinkled with dark fuscous specks. Hindwings grey, variable in intensity, darker in ♀; cilia whitish-yellowish with two faint greyish shades.

Maskeliya, Peradeniya, and Maturatta, Ceylon, in September and from January to April (Pole, Green). Larva feeding in galleries of silk and refuse on lichens on mossy rocks (Green).

Autosticha tetrapeda, n. sp.

♂. 13 mm. Head and thorax pale brownish-ochreous. Palpi whitish-ochreous, second joint and middle of terminal joint tinged with brownish. Antennæ whitish-ochreous ringed with fuscous, towards apex suffused with dark fuscous. Abdomen whitish-ochreous. Forewings elongate, costa gently arched, apex obtuse, termen obliquely rounded; pale brownish-ochreous, sprinkled with fuscous; blackish dots on base of costa and dorsum; stigmata large, blackish, plical beneath first discal; a similar blackish spot on dorsum beneath second discal; an almost marginal row of blackish dots along posterior part of costa and termen: cilia whitish-ochreous, basal half sprinkled with fuscous. Hindwings light grey, paler and thinly scaled towards base; cilia whitish-ochreous.

Palni Hills; one specimen (Campbell).

Autosticha demotica, n. sp.

♂ ♀. 13-18 mm. Head and thorax light fuscous. Palpi fuscous, apex of second joint ochreous-whitish, terminal joint as long as second, ochreous-whitish, more or less suffusedly banded with fuscous in middle. Antennæ whitish-ochreous obscurely ringed with fuscous. Abdomen light greyish-ochreous. Forewings elongate, costa moderately arched, apex obtuse, termen obliquely rounded; light fuscous or greyish-ochreous; a dark fuscous dot on base of costa; stigmata very small, dark fuscous, discal stigmata approximated, separated by ⅛ of wing, plical beneath first discal; an almost marginal series of indistinct dark fuscous dots along posterior part of costa and tornus: cilia whitish-ochreous. Hindwings grey; cilia pale ochreous-greyish.

Peradeniya, Madulsima, and Ambulangoda, Ceylon, in February, April, June, and August; five specimens (Green, Vaughan, Pole). Very similar to *A. strenuella*, but broader-winged, and discal stigmata obviously closer together.

Autosticha phaulodes, n. sp.

♂♀. 12—15 mm. Head and thorax brownish-ochreous sprinkled with dark fuscous. Palpi whitish-ochreous, second joint irrorated with dark fuscous, terminal joint as long as second, with dark fuscous median band. Antennæ fuscous, obscurely pale-ringed. Abdomen fuscous, apex whitish-ochreous. Forewings elongate, costa gently arched apex obtuse, termen slightly rounded, oblique; brownish-ochreous, irrorated with fuscous and dark fuscous; stigmata moderate or large, dark fuscous, plical somewhat before first discal; a small prætornal spot of dark fuscous suffusion; an almost marginal series of dark fuscous dots along posterior portion of costa and termen: cilia very pale greyish-ochreous, basal half light brownish-ochreous, with some basal dots and a median line of scattered dark fuscous specks. Hindwings grey; cilia ochreous-grey-whitish.

Madulsima, Ceylon, in April and May; nine specimens (Vaughan). Hitherto confused with *chernetis*, and included under it in my description: smaller than *chernetis*, forewings narrower and termen more oblique, yet broader and less oblique than in *authæma*; duller and more uniformly coloured than either, with plical stigma rather before first discal instead of beneath it: basal half of cilia not yellowish-tinged as in both these.

Autosticha chernetis, Meyr.

As indicated above, my description of this species includes *phaulodes* as well; I restrict the name to the species bred by Mr. Green from larvæ found at Peradeniya, with habits as described. The description as published only needs to be altered in the following particulars, *viz.*:—

♂♀. 16—17 mm. Forewings with discal stigmata large, plical beneath first discal. Bred in February and March.

Apethistis, n. g.

Head with appressed scales, side-tufts somewhat raised; ocelli absent; tongue developed. Antennæ ⅘, in ♂ serrulate, shortly ciliated, basal joint moderate, without pecten. Labial palpi long, recurved, second joint with appressed scales, terminal joint nearly or quite as long as second, slender, acute. Maxillary palpi rudimentary. Posterior tibiæ clothed with rough scales. Forewings with 1b furcate, 2 and 3 stalked from angle, 7 and 8 stalked, 7 to termen, 11 from middle. Hindwings 1, trapezoidal, termen sinuate, cilia ¾—1; 3 and 4 connate, 5 approximated, 6 and 7 stalked.

Type *A. metoeca*, Meyr. Closely allied to the preceding genus, from which it only differs in the presence of vein 8 of forewings. To this genus is also referable *Gelechia alienella*, Walk. 634.

Apethistis carphodes, n. sp.

♂♀. 15—16 mm. Head pale ochreous-yellowish, sides deeper. Palpi light ochreous-yellowish, second joint sprinkled and lower half suffused with fuscous. Antennæ light yellowish, obscurely ringed with fuscous. Thorax ochreous-yellowish, sprinkled with fuscous. Abdomen light ochreous-yellowish. Forewings elongate, costa moderately arched apex obtuse, termen sinuate, oblique;

whitish-ochreous-yellowish, irregularly sprinkled with deeper ochreous-yellow scales tipped with dark fuscous : blackish dots at base of costa and dorsum, and a short blackish dash beneath costa near base ; stigmata blackish, plical rather obliquely before first discal, both moderate, second discal large, round ; patches of fuscous suffusion irrorated with blackish towards costa about ⅔ and beneath second discal stigma, varying much in development ; a blackish dot on dorsum before tornus ; an almost marginal series of undefined blackish dots along posterior part of costa and termen, not reaching tornus : cilia whitish-ochreous-yellowish, deeper on basal half, sometimes sprinkled with fuscous. Hindwings grey ; cilia whitish-yellowish, in ♀ greyish-tinged, with grey subbasal shade.

Khasi Hills, from July to September ; eleven specimens.

Apethistis metoeca, n. sp.

♂ ♀ 14—16 mm. Head ochreous-whitish sprinkled with dark fuscous, centre of crown tinged with fuscous. Palpi ochreous-whitish, somewhat sprinkled with dark fuscous, second joint suffused with dark fuscous except apex. Antennæ light fuscous. Thorax fuscous, paler-sprinkled. Abdomen fuscous, segmental margins whitish-ochreous. Forewings elongate, rather narrow, costa moderately arched, apex round-pointed, termen somewhat sinuate, rather strongly oblique ; fuscous, irregularly sprinkled with paler and dark fuscous, appearing grey ; costa anteriorly suffusedly irrorated with dark fuscous, with a short dark fuscous dash beneath costa near base ; stigmata moderate, dark fuscous, plical obliquely before first discal ; a streak of fuscous suffusion irrorated with dark fuscous from ⅓ of costa to above second discal stigma ; a spot of dark fuscous suffusion on dorsum before tornus ; an almost marginal series of undefined dark fuscous dots along posterior fourth of costa and termen : cilia pale greyish-ochreous, somewhat sprinkled with fuscous. Hindwings grey ; cilia light grey.

Maskeliya, Ceylon, from January to August ; twelve specimens (Pole). Very like *alienella*, but is a grey species, whilst *alienella* is brownish-ochreous in general colouring.

FURTHER NOTES ON BIRDS OF THE PROVINCES OF KASHMIR AND JAMMU AND ADJACENT DISTRICTS.

BY

COLONEL A. E. WARD.

(Continued from page 949 of Volume XVII.)

The first part of this list was published in April 1906 and included the results of investigations up to 1906. Since then the results of expeditions into Ladak, Kistwar and Badrawar have been tabulated. Where any fresh information was gathered I propose to enter it shortly in these notes.

ORDER PASSERES. FAM. CORVIDÆ.—Crows, &c.

(28). *Nucifraga multipunctata.*—The Larger-spotted Nutcracker. The young of this bird were hatched out on April 29th, it is probable that this bird has two clutches during the summer.

FAM. CRATEROPODIDÆ.—Laughing Thrushes.

(259). *Leptopœcile sophiæ.*—Stoliczka's Warbler-Tit. In the summer of 1906 my collector secured a specimen in the Nubra valley. Other specimens I have are from Turkestan.

FAM. REGULIDÆ.—Gold Crests.

(358). *Regulus cristatus.*—The Goldcrest. The eggs were taken in the Liddar valley by Col. K. Buchanan's collector in May and by my men on June 19th, July 2nd and July 6th ; the clutch consists of 4 eggs, white spotted with red at the thick end, less so towards the thinner. On one occasion the male, female and nest were secured, on others the male or female. That taken on June 19th was watched whilst being built.

FAM. SYLVIIDÆ.—Warblers.

(401). *Sylvia althæa.*—Hume's Lesser White-throated Warbler. The eggs of this Warbler were taken by myself in Kashmir at 8,000 feet elevation on May 27th and also on the Ladak Road near Kargil in 1906, by my collector, Mr. C. H. Crump.

(408). *Phylloscopus indicus.*—The Olivaceous Willow-Warbler. The eggs of this Warbler were taken in Ladak at 11,500 feet altitude in August 1906 and a female bird was shot in June at Bât-Kurbo, Ladak Road.

(411). *Phylloscopus neglectus.*—The Plain Willow-Warbler. Mr. C. H. Crump (Collector) secured the birds and eggs (4) on May 28, 1906, at Kargil and again on June 22nd.

FAM. LANIIDÆ.—Shrikes.

(477). *Lanius tephronotus.*—The Grey-backed Shrike. This bird breeds in Poonch, generally in May.

FAM. ORIOLIDÆ.—Orioles.

(519). *Oriolus galbula.*—The European Oriole. Rattray has already told us about this Oriole breeding near Murree, and in the summer of 1906 several eggs were secured in Poonch territory.

FAM. STURNIDÆ.—Starlings.

(544). *Temenuchus pagodarum.*—The Black-headed Myna occurs in Badarwa.

FAM. MUSCICAPIDÆ.—Flycatchers.

(566). *Cyornis hyperythrus.*—The Rufuous-breasted Blue Flycatcher was found with a clutch of 4 eggs in the Liddar valley, Kashmir, on June 15, 1907. The eggs are pale brownish white, suffused with brownish red. This is the only specimen I have obtained in Kashmir.

FAM. TURDIDÆ.—Chats, Thrushes, &c.

(618). *Saxicola picata.*—The Pied Chat was shot by Mr. Crump at Kargil on September 2nd, 1906.

(621). *Saxicola pleschanka.*—The Siberian Chat. A pair of these birds were observed building at Kargil on May 28th.

(624). *Saxicola œnanthe.*—The Wheat-ear Chat. A single specimen was shot in the Wardwan valley in September 1907.

(626). *Saxicola deserti.*—The Desert Chat was found in Ladak during the summer of 1906.

(637). *Microcichla scouleri.*—The Little Forktail. I saw several of these birds in 1906 and 1907 in Kashmir and took the nest on 19th June, but the eggs were hard set, they were dull white in colour, sparsely spotted with reddish brown at the thin end, more so at the thick, and measured ·85 by ·58 inches. The nest was a large one, measuring 4½ inches high and 3¾ in diameter.

(639). *Ruticilla frontalis.*—The Blue-fronted Redstart. The eggs of this bird (3 clutches) were obtained on the 5th and 11th August at 11,000 feet in Kashmir.

(645). *Ruticilla erythrogaster.*—Güldenstadt's Redstart. All efforts to obtain this bird's eggs have so far failed, the young were just able to fly in July; as I said before, it breeds in Ladak.

(648). *Cyanecula wolfi.*—The White-spotted Blue-throat. Crump secured an egg for me at Kalchar on the Shyok river, Ladak, on August 11th, and also the young birds; they were in a hole in a small tree.

(654). *Ianthia rufilata.*—The Red-flanked Bush-Robin. Amongst the clutches taken in 1906-1907 one set was almost pure white.

We have still much to learn regarding the breeding of the Chats and Redstarts, and still more as regards the *Fringillidæ*. Evidently many of the finches breed very late in the season, but whether they all have two broods or not, it is difficult to say: during the present year a certain amount of knowledge has been obtained.

FAM. FRINGILLIDÆ.—Finches.

(743). *Pycnorhampus carneipes.*—The White-winged Grosbeak. In March last I obtained a specimen not very far from Srinagar at about 7,000 feet, and several from Pyas, Kishtwar, in July and August.

(745). *Pyrrhula aurantiaca.*—The Orange Bullfinch. At last the nests and eggs (3) have been obtained by my collectors. These were found on the Kolahoi mountain in Kashmir between 12,000 and 13,000 feet in a bush. The nests are small cups of dry grasses lined with the hair of the musk deer; the eggs are of a dull white marked with reddish brown in small streaks and spots chiefly at the thicker end. The dates were August 18th and 21st.

(754). *Propasser thura.*—The White-browed Rose-finch. Three clutches of eggs (4), (3), (4), were found on August 6th, 9th and 10th, very high up in the hills where the Sind and Liddar rivers rise, in Kashmir. The nests were in bushes and in the creeping juniper plants, they were composed of soft grasses and seedpods, were large and saucer shaped. The eggs are devoid of gloss greenish blue in colouring, sparingly spotted at the thick end with black. One clutch is very pointed. The eggs average ·85 × ·60 inches; those taken by Mandelli in Nepal were said to be marked brownish grey.

(758). *Propasser rhodochrous.*—The Pink-browed Rose-finch. The eggs of this bird are not often taken in Kashmir, but in August 7th and 9th the Srinagar Museum collectors and my men secured clutches of (5), (4), (5) and (4) at about 11,000 feet altitude.

(762). *Carpodacus severtzovi.*—Severtzoff's Rose-finch. This bird was found breeding near the Pangong Lake, Ladak, and the eggs taken on June 21st and July 2nd; they were of the usual greenish blue marked with black.

(765). *Procarduelis nepalensis.*—The Dark Rose-finch. I have two specimens from Kishtwar shot in August.

(768). *Callacanthis burtoni.*—The Red-browed Finch, as I before mentioned, breeds in Kashmir. The nest was very small, composed almost entirely of the spines of the blue pine, and was in a big fir tree; it was found at an altitude of 9,000 feet at Kolahoi. The eggs are rather a blunt oval ·88 × ·65 inches and of a greenish blue marked with very dark brown spots at the thick end. A second nest was being built, but apparently was forsaken by the birds; this also was in a large fir.

(770). *Acanthus brevirostris.*—The Eastern Twite breeds in Ladak: clutches of 3 were found at Tankse, July 6th, at Khardong, Ladak, on July 27th and 28th, and a clutch on July 29th. All these were in bushes.

(771). *Metoponia pusilla.*—The Gold-fronted Finch was breeding in Kashmir in May, as I have the eggs taken in July in Swin, it probably has two clutches yearly.

(785). *Montifringilla adamsi.*—Adam's Mountain-Finch. On June 5th, 1906, I got 3 eggs on the Fotula, Ladak Road, and young birds just leaving the nest at 14,000 feet on Aug. 20th, 1906; this also points to two clutches yearly.

(788) *Fringillauda brandti.*—Brandt's Mountain-Finch was obtained in June and July 1906 in Ladak up to 16,000 feet, but I have again been unsuccessful in finding eggs or nestlings.

(789). *Emberiza schœniclus.*—The Reed-bunting. On September 30, 1906, I shot this bird near Srinagar.

(790). *Emberiza fucata.*—The Grey-headed Bunting was found in Badarwa.

(796). *Emberiza hortulana.*—The Ortolan Bunting. Mr. S. Baker kindly identified a specimen for me which was collected in March 1907 near Srinagar.

(803). *Emberiza melanicterus.*—The Crested Bunting. I have this bird from Badarwa, dated May 10, 1907.

ORDER ACCIPITRES. FAM. FALCONIDŒ.—Eagles, &c.

(1205). *Aquila maculata.*—The Large Spotted Eagle was observed by Mr. C. H. Donald in Badarwa.

(1256). *Falco barbarus.*—The Barbury Falcon. The occurrence of this falcon was kindly noted for me by Mr. C. H. Donald who saw it in Badarwa.

ORDER LIMICOLÆ. FAM. CHARADRIIDÆ.—Waders.

(1453). *Ibidorhynchus struthersi.*—The Ibis-bill. I mentioned finding the young birds. Col. Buchanan took 3 eggs in May 1907 on the same island where the young birds were in 1906.

(1464). *Totanus calidris.*—The Redshank breeds near Shushal in Ladak where Crump took clutches of (4), (4) and (3) towards the end of June.

On March 8, 1907, I secured a specimen of *Ampelis garrulus*, the Waxwing, in Dachjam ravine, Kashmir, at about 7,000 feet. Amongst eggs of the Warblers which have only lately arrived from Kishtwar, I hope to have something to communicate hereafter; at present I prefer to get other opinions as to the identity of the birds.

A SUB-DIVISION OF THE OLD GENUS *NESOKIA*, WITH DESCRIPTIONS OF THREE NEW MEMBERS OF THE GROUP, AND OF A *MUS* FROM THE ANDAMANS.

BY

OLDFIELD THOMAS.

(From "*The Annals and Magazine of Natural History*" (7) xx. p. 202.)

The genus *Nesokia* contains three such very distinct and natural groups that in accordance with modern ideas they should be recognized as distinct genera. Their respective characters have already been described by Anderson, Blanford and myself, but the most tangible may be briefly recapitulated as follows:—

I. NESOKIA, Gray, Ann. & Mag. N. H. x., p. 264 (1842).

Type *Arvicola indica*,[*] Gray & Hardwicke. (*Nesokia Hardwickei*, auctorum).

Skull short and broad. Palatal foramina short. Molars laminate, least *mus*-like.

Mammæ 2-2=8.

II. GUNOMYS[†], gen. nov.

Type.—*Arvicola bengalensis*, Gray & Hardwicke. (*Nesokia bengalensis*, auct.)

Skull broad. Palatal foramina long.

Mammæ irregular, 14-18 in number.

III. BANDICOTA, Gray, Ann. & Mag. N. H. (4) xii, p. 418 (1873).

Type, "*Bandicota gigantea*", i.e., *B. bandicota*, Bechst.

Skull comparatively long and narrow. Palatal foramina long. Molars most *mus*-like.

Mammæ 3-3=12.

These three genera are specialized in the order given, *Nesokia* being the most extreme and the farthest from *Mus*, both in skull, tooth-structure, and external characters, and *Bandicota* the nearest, while *Gunomys* is intermediate between the other two.

[*Nesokia suilla*, sp. n. being found in Egypt we have omitted Mr. Thomas' description.—EDS.]

GUNOMYS VARIUS, sp. n.

The Malay representative of *G. bengalensis*.

Size decidedly larger than in *G. bengalensis*. Fur very coarse and harsh though not to be called spiny; freely mixed with longer piles attaining 3—4 cm., in length. General colour above coarsely mixed black and cream-buff, without the brown tints of G. *bengalensis*. Individually the ordinary hairs are slaty at base, black at tip, with a broad cream-buff subterminal band; the longer piles black a few of them white. Under surface dull grizzled greyish, the slaty-grey bases of the hairs more conspicuous than their dull w tish tips. Head and dorsal line particularly heavily pencilled with black. Ears brown. Hands and feet brown on the middle of the metapodials, whitish laterally and on the digits. Tail well clothed with coarse hairs 2—3mm. in length; dark brown above, rather paler below.

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[*] Bechstein's *Mus indicus* being now removed, as a *Bandicota*, from the genus *Nesokia*, the specific term given by Gray and Hardwicke again becomes tenable for the animal usually known as *Nesokia Hardwickei*. The same specimen (B. M. No. 99*a*) is the type of both names.

[†] γοῦνος, fruitful, prolific.

Skull similar in general characters to that of *G. bengalensis*, but larger and heavier throughout.

Dimensions of the type (measured in the flesh):—

Head and body 266 mm; tail 197; hind foot 40; ear 19.

Skull; condylo-basal length 48; basilar length 43; greatest breadth 26—7; nasals 16 × 5·2; interorbital breadth 6·5; frontal height* 15·5; palatilar length 25·5; diastema 16·3; palatal foramina 10 × 2·6; length of upper molar series (crowns) 7·3, (alveoli) 8·5.

Habitat.—Georgetown, Pinang, Malay Peninsula.

Type.—Adult male. B. M. No. 98.8.3.3. Collected 8th April 1898, and presented by Capt. S. S. Flower.

This is the "*Mus setifer* Horsfield," of Dr. Cantor's "List of Malayan Mammals,"† a specimen collected by him in Pinang having been received with the Indian Museum collections in 1879.

G. varius is distinguishable from *G. bengalensis* by its coarse fur, variegated colour, and comparatively large size.

GUNOMYS VARILLUS, sp. n.

Like *G. varius*, but very much smaller.

Size very small, scarcely equalling the smallest S. Indian species of the genus. Fur coarse; longer piles almost confined to the posterior back. General colour above about as in *G. varius*, or rather more buffy, but the mixture is finer, not so coarsely variegated. Under surface dull greyish, the hairs slaty at base, dull creamy terminally. Hands and feet brown. Tail more finely scaled than in *G. varius*, uniformly brown. Skull very much smaller in all dimensions than that of *G. varius*, but essentially similar in form. Nasals short and narrow. Supraorbital ridges less heavily developed. Anterior zygomatic plate well projected forwards, much more so than in the equally small S. Indian *G. kok*. Palatal foramina of equal breadth for their anterior two-thirds, narrowed in their posterior third.

Dimensions of the type (measured in skin):—

Head and body 184 mm; tail 137; hind foot 36·5; ear 16.

Skull; condylo-basal length 40·5; basilar length 35; greatest breadth 23; nasals 13 × 4·3; interorbital breadth 5·7; frontal height 12·5; palatilar length 21; diastema 13; palatal foramina 8 × 2·4; length of upper molar series (crowns) 7, (alveoli) 8.

Habitat.—Georgetown, Pinang.

Type.—Adult male. B. M. No. 98.8.3.5. Collected and presented by Capt. S. S. Flower. Another specimen obtained by Dr. Cantor.

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* From the supraorbital ridge to the alveolus between m¹ and m².

† J. A. S. B. XV, p. 254 (1846).

Both Dr. Cantor in 1845, and Capt. Flower half a century later obtained in the little island of Pinang examples representing two species of this genus, a large and a small. The former marked both his specimens as "*Mus setifer*" evidently taking them for the same species, but there cannot be the slightest doubt that they are quite distinct animals, their difference in size being far too great to be due to individual variation.

MUS ROGERSI, sp. n.

A spinous-haired species with 1-3 = 8 mammæ.

Size of *Mus norvegicus*. Fur coarse, profusely mixed with spines, which on the back are about 16 mm. in length by 0·4 mm. in breadth. General colour coarsely grizzled ochraceous brown, the bases of both hairs and spines pale grey and tips of the spines black and of the ordinary hairs ochraceous. The few long bristle-hairs are wholly black. Sides greyer. Under surface not sharply defined, pale buffy greyish, the hairs pale slaty at base, dull cream-buff terminally. Ears finely haired, dark grey. Limbs dark grey externally, light grey like belly along their inner aspect. Hands and feet white above, the metapodials slightly darker ; fifth hind toe, without claw, reaching to the end of the first phalanx of the fourth. Tail rather shorter than head and body, almost naked ; rings of scales about 10 to the centimetre ; dark brown above, whitish flesh-colour below. Mammæ 1-3 = 8.

Skull strongly built, with well marked supraorbital beads, which are continued across the parietals to the corners of the interparietals. Muzzle rather narrow, parallel-sided. Palatal foramina not reaching back to the level of the molars. Mesopterygoid fossa broadly rounded in front, its anterior limb slightly anterior to the front end of the parapterygoid fossæ on each side of it. Bullæ of medium size. Molars small in proportion to the general size.

Dimensions of the type (measured on the spirit-specimen before skinning) :—

Head and body 195 mm. ; tail 188 ; hind foot (s. u.) 41 ; ear 28.

Skull, greatest length 48·5 ; basilar length 40 ; zygomatic breadth 22·5 ; nasals 18 × 5 ; interorbital breadth 7·2 ; greatest separation of parietal ridges 16 ; palatilar length 23·3 ; diastema 14·2 ; palatal foramina 9·2 ; length of upper molar series 7·8.

Habitat.—W. Coast of South Andaman Island, north of Iké Bay.

Type.—Adult female. B. M. No. 6.4.13.2. Collected February 1904, and presented by C. G. Rogers, Esq.

In spite of the number of rats recently described by Mr. G. S. Miller[*] from the Andaman group, this fine species does not appear to have been previously obtained. Its unusual mammary formula, 1-3 = 8, is alone shared, in the whole of the Muridæ, by *Mus bagobus*, Mearns, from the Phillippines, and *Mus pulliventer*, Miller, from the Nicobars, of which latter it may be the Andaman representative, but from which it differs by its markedly larger size and distinctly bicolor tail.

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[*] Pr. U. S. Nat Mus XXIV, p. 758 (Synopsis of species) (1902).

A NEW LONG-EARED BAT FROM NORTHERN INDIA.

In a recent number of *The Annals and Magazine of Natural History* (Vol. 20, No. 120, December 1907, p. 521), Mr. G. E. H. Barrett-Hamilton, under the heading " Descriptions of two new species of *Plecotus*," describes the following new species of Long-eared Bat from Northern India :—

PLECOTUS PUCK, sp. n.

This bat resembles *P. auritus* of Britain and is of similar size, but has a quite distinct skull.

The *colour* of the basal portions of the hairs is everywhere dusky, the tips are above between Ridgway's "Isabella colour " and "broccoli-brown," below whitish ; the upper side has a grizzled appearance. The *skull*, as compared with Central European examples (? *austriacus* or Geoffroy), is smaller, but about equal in size to those from England. The facial region and palate are, however, narrower and the backward extension of the latter less pronounced ; the auditory bullæ are larger. The *dimensions* of the type (in millimetres) are as follows :—

Head and body 40 ; tail 50 ; ear 41 ; ear from the notch 32 ; tragus 16 ; thumb without claw 8 ; longest digit 60 ; basal joint of fifth digit 32; basal joint of second digit 34·5 ; forearm 38 ; tibia 17 ; hind foot without claw 8.

The type is a skin, No. 5.11.19.1. of the British Museum collection. It is a male taken at Murree, N. India, altitude 7,500 feet, by Capt. E. T. F. Birrell, R.A.M.C., on the 20th of August 1905.

This bat approaches more closely to European *Plecoti* than to others in the Museum from Tor, Sinai, and from Ladak. The latter are in both cases larger, in which character they agree with two from Hokkaido, Japan. They are, perhaps, referable to Hodgson's *P. homochrous*.

A LIST OF PUBLICATIONS RELATING TO INDIAN FAUNA

FROM

THE "ZOOLOGICAL RECORD," 1905.

The list of publications given herewith has been compiled from the "*Zoological Record*" for 1905 and is in continuation of previous lists for 1903-04 published at page 505 of Vol. XVII of this Journal. It is proposed to continue the preparation of such lists each year as the volumes of the "*Zoological Record*" are published and it is hoped that these lists will assist members who wish to ascertain what research is being carried on in regard to the fauna of India. Papers which have appeared in our own Journal have of course been omitted.

GENERAL SUBJECTS.

GARDINER, J. S.—The fauna and geography of the Maldive and Laccadive Archipelagoes. II. Pt. iv, and Supplement i.

MAMMALIA.

BONHOTE, J. L.—On the Mouse-Hares of the genus *Ochotona*. P. Zool. Soc., London, 1904, ii, pp. 205-219.

BURNE, R. H.—On the viscera of an Indian Rhinoceros. P. Zool. Soc., London, 1905, i, pp. 56-58.

LYDEKKER, R.—The Gorals of India and Burma. Zoologist, 1905, pp. 81-84.

MENEGAUX, A.—Sur l'aire de dispersion du *Felis temmincki*. Bull. Mus., Paris, 1905, pp. 72 & 73.

PILGRIM, G. E.—On the occurrence of *Elephas antiquus* (*namadicus*) in the Godaveri alluvium. Rec. Geol. Surv., India, xxxii, pp. 199-218, pls. ix-xiii.

SKINNER, B.—Plague and the geographical distribution of Rats. Brit. Med. J., May 5th, 1905.

WILLEY, A.—The lacteal tract of *Loris gracilis*. Spolia Zeylan., iii, pp. 159-162, fig.

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THE PROTECTION OF WILD BIRDS AND GAME IN INDIA.

The Bombay Natural History Society has for many years been urging the necessity of providing most of the wild birds and animals in India with protection in the shape of an annual close season. It is to be regretted that so far no satisfactory legislation has been enacted which provides this protection throughout British India, although various Local Governments have at different times passed rules and regulations which give partial protection to game within certain limits. The members of this Society will therefore, it is believed, welcome the resolution which was passed at the Indian Railway Conference Association held at Simla in September and October 1907, as one more step towards the desired efficient protection of wild animals and birds in this country:—

SUBJECT 32.

Carriage of wild birds and game during the close season.

It was proposed by Mr. Dring (East Indian Railway) and seconded by Mr. Pendlebury (His Highness the Nizam's Guaranteed State Railway) that

The notice, dated 16th November 1903, issued by the East Indian Railway be adopted as a bye-law in through booking of wild birds and game, with the omission of the words "usually extending from 15th March to 1st October."

And carried *nem con.*, the voting being as follows:—

Railway.	No. of votes.	Voting.	
		Aye.	No.
Assam Bengal Railway	4	Absent	...
Bengal & North Western Railway	7	7	...
Bengal Doors Railway	1	1	...
Bengal Nagpur Railway	9	9	...
Bhavnagar Gondal Junagadh P. Railway ...	2	2	...
B. B. & C. I. Railway	10	10	...
Burma Railways	7	7	...
Calcutta Port Commissioners	1	1	...
Eastern Bengal State Railway	7	7	...
East Indian Railway	10	10	...
Great Indian Peninsula Railway	10	10	...
His Highness the Nizam's Guaranteed Railway	4	4	...
Jodhpore Bikanir Railway	4	4	...
Madras Railway	7	7	...
North Western Railway	10	10	...
Oudh & Rohilkhand Railway	6	6	...
Rohilkhand & Kumaon Railway	2	2	...
South Indian Railway	6	6	...
Southern Mahratta Railway	7	7	...
Total	114	110	...

The notice will now read as follows:—

"It is hereby notified that under Act No. XX of 1887 of the Government of India for the protection of wild birds and game, the Railway Company will not accept for despatch by rail such consignments the possession of which is notified by Government to be illegal during the close season, or between such dates as may be fixed by the Local Government of the District or Province concerned. In the event of such consignments being accepted by the Railway Company for despatch during the said period, *viz.*, the close season, through misdeclaration or any other cause whatsoever, the consignor will render himself liable to punishment by fine or otherwise as notified by Government for any breach of rules relating to game."

30th September 1907.

REVIEW.

"THE GAME ANIMALS OF INDIA, BURMA, MALAYA AND TIBET."

A NEW AND REVISED EDITION OF THE GREAT AND SMALL GAME OF INDIA, BURMA AND TIBET, BY R. LYDEKKER.

In these days when there are so many contributors to our knowledge of the larger mammals that come under the designation of "Game" — large and small—and facilities for travel are being continually extended in such countries as India and its dependencies, it is extraordinary how quickly a book relating to them becomes out of date and requires revising in accordance with extended acquaintance with the animals of whose forms and habits it treats. Such a work was Mr. R. Lydekker's handsome quarto volume on "The Great and Small Game of India, Burma and Tibet" which was published seven years ago. At that time it could fairly be considered the embodiment of the latest conclusions of science and of records in a concise form that would suit the sportsman's requirements; and its popularity and usefulness, in spite of its somewhat bulky form and high cost, is evidenced by the fact that it is now out of print. The sportsman's library, owing to the steadily increasing demand for such works, is for this reason certainly kept better supplied with revised editions in a concentrated form than that of the more scientific student, for the latter has to keep in touch with a vast number of technical periodicals if he desires to be abreast of the times with his nomenclature and information. As an instance in point we may mention the volume on Mammalia in the "Fauna of British India," which was completed and published by the late Dr. Blanford in 1891. Excellent and of the greatest value to every student of Indian mammals as it was then and for some years, it is by now almost hopelessly obsolete so far as nearly all the smaller mammals are concerned, and until a new edition is forthcoming is in danger of hampering rather than assisting the ordinary naturalist, who is unable to do more than spend a few odd hours or days at the British Museum after four or five years of hard work in the East. Lucky it is for the sportsman, therefore, that things keep moving and that the re-issue of such books as Mr. Lydekker's is encouraged, for besides the additions bringing the material up to date, experience indicates other minor improvements. In this case these have, amongst others, taken the form of a much more convenient octavo size and a greatly reduced cost without sacrificing to any material extent its utility or its excellent plates.

The rapidity with which the times move now-a-days is indicated in the author's preface, in which he refers to the opportunity he had had, since the text was in type, of examining a specimen of the red Serow, that was described by Blyth from the hill-ranges of Aracan on the sea-board of Upper Burma in 1863 and that now at last turns up in a locality so far distant as near Mogaung on the eastern border of the Singpo country. The question of regarding the red Serow as a "colour-phase" or as a "local-race" of course suggests itself and points to the opportunities for sportsmen in Upper Burma to give their help towards defining the range and forms of this and the well known Burmese Serow.

The inclusion of the Malay Peninsula in the scope of the book is another noteworthy improvement, as many of the Tenasserim and Burmese animals are distinctly of a Malay type as opposed to those of India proper which are typical of the Oriental region. To the north and west of course the fauna becomes typical of the Eastern Holarctic or Palæarctic region, which gradually passes into and includes the whole of Northern Asia and Europe. A short and concise resumè of the meeting grounds of these various faunas is included in the Introduction, as well as the minor sub-divisions of Peninsular India.

The body of the work includes of course the descriptions, measurements, distribution, habits and life-history of the animals, and is on the same lines as the previous edition. Considering the limited space available, the book is a worthy example of the amount of information that it is possible to concentrate into a few words. Every paragraph is a model of conciseness of just what the sportsman-naturalist wants to know as a guide to the enjoyment of his recreation, while we are pleased to notice the constant references to the points in which his experiences and observations can be turned to good use for the advancement of our knowledge of the animals he may come across during his wanderings. For instance it has yet to be decided whether the practically unknown Singpho Rhinoceros, reputed by natives to be a beast of great size and of which a fine horn is recorded, is more nearly related to the great Indian Rhinoceros (*R. unicornis*) than to other two-horned speeies. An authentic specimen of this Rhinoceros should prove an event of almost equal scientific interest to the discovery of the Okapi although it may not attain the same advertisement.

There is again much yet to be learned about the varieties and range of the Burmese Bantin or Tsaine (*Bos sondaicus*), of which little was known till lately and which "may perhaps extend northwards to the hill ranges east of Chittagong." Even of so familiar an animal as the Arna or Indian Buffalo (*Bos bubalis*) there is still information required on the question of whether the buffaloes of the Malay Peninsula are truly wild animals or merely descendants of herds escaped from captivity. The author instances the evidence in favour of the former from the type of horns represented by a photo of two skulls "brought by a missionary from Singapore" and suggests that "any authentic information that sportsmen can furnish with regard to wild buffaloes in Burma and the Malay States will be of value and interest." It seems strange that the most important evidence on the point should rest upon an amateur snap shot at the present day.

We will next mention the Takin (*Budorcas taxicolor*), which still retains its unique position among the few "animals coming under the designation of big game that have not fallen to the rifle of the British sportsman." To some it may seem rather far fetched to designate the Takin as "big-game", for this "strange-looking ruminant" can hardly be expected to rank among the sought-for trophies of the big game hunter, as its "head" is not imposing and there is nothing specially interesting except to the naturalist in the clumsily-built form of the animal. We are at last in possession of authentic photographs that have been reproduced in the *Field* of 13th October 1906 and in our Journal (Vol. xvii, p. 842) taken of a young live male which was given to Mr. J. C. White, Political Officer, Sikhim. The animal, however, died very soon after these were taken. Considering that its range extends from the country north of Bhutan through Eastern Tibet into Szechuen there are opportunities for original research on its habits, &c., by sportsmen, besides the originality of the trophy awaiting them.

A far nobler "head" awaits the sportsman who is fortunate enough to make personal acquaintance with the Shou or Sikhim stag (*Cervus affinis*), and although some interesting information as to its geographical range has lately been contributed, it still presents a field for useful investigation, as "few British sportsmen have seen the Shou alive."

Of the rest of the deer and antelopes, the cats, pigs and dogs, nothing remarkable is now brought before the notice of the reader, but we find some interesting references to the relationships of the Panda (*Ælurus fulgens*) of the Eastern Himalayas, which was given the popular name of "The Red Cat-bear or Himalayan Racoon" by Blanford and which the author describes as "one of the most beautifully coloured of all mammals," and of its equally puzzling and lesser-known relative of Eastern Tibet that is known as the "Short-tailed Panda" (*Æluropus melanoleucus*). Regarding the latter it is pointed out that further information is required regarding the protective utility or the warning-colour nature of its conspicuous black and white pelt.

The volume concludes with a short note on the different hares that are known from the countries under consideration, but like all "small fry" that provide no trophies they have hardly yet been seriously studied in India and its dependencies. Hares are generally looked upon by the casual sportsman as just the ordinary hare of the district and as a useful casual addition to the stewpot, so that it will probably be some years yet before the necessary full series of good specimens is available from all parts for proper comparison This book is, however, essentially for the use of the sportsman, and he will, we fear, never be persuaded to trouble his head about such animals as hares.

We must not omit to mention the complete index that is appended of the scientific and popular names, as this forms a very necessary part of any work of this nature.

NOTICE.

In order to facilitate reference, the Miscellaneous Notes are now published in the following order of subjects :—

MAMMALS,
BIRDS,
REPTILES,
FISHES,
INSECTS,
GEOLOGY,
BOTANY,
GENERAL,

instead of, as hitherto, according to the date on which they have been received.

EDITORS.

MISCELLANEOUS NOTES.

No. I.—A GAUR ATTACKING AND KILLING A MAN WITHOUT PROVOCATION.

As I believe instances of unwounded bison making a determined and unprovoked attack on human beings are rare, possibly the following account may be of interest. I cannot personally vouch for the facts, but can only tell the story as told to me on the spot, and add that I have no reason to doubt it, and it is a fact that a native was killed by a bison.

At the end of May last I went out after bison in the C. P. In sending me the permit, about 6 weeks previously, the Forest Officer told me there was a savage old bull at the place I was going to that had recently killed a native. One of my trackers turned out to be the brother of the man killed, and he told me—and other local natives corroborated his statement—that his brother had been quietly cutting grass in a glade in the forest when a bull bison deliberately charged him from the other end of the glade, they said, 150 yards off. The man climbed a bamboo clump to escape, when the bull went for the clump, more or less broke it down, knocked the man out of it and killed him. According to their account it was a most deliberate, savage and unprovoked attack. I was fortunate enough to get this bull after four days' hard tracking with a shade temperature of 98° to 102°. He did not then appear to be particularly savage. Though wounded and being continually "jumped," in dense jungle where it was impossible to go noiselessly on account of the dead leaves, he only twice showed fight. The first time a shot in the back of the neck, which only missed the spinal cord by about 2″ turned him, and the second time he was practically done and exposing his side as he swung round at close range was finished off.

As near as I could tell, he was about 12 or 13 years old and had a very perfect and massive head with a spread of 40″. He was in prime condition and showed no signs of having been previously wounded, but there were not enough men to roll him over so as to examine both sides.

H. V. BIGGS, Lt.-Col., R.E.

Mhow, C. I., *Sept.* 1907.

No. II.—THE EFFECT OF STRYCHNINE ON WILD DOGS.

I venture to address you with reference to Mr. Witt's letter on the difficulties of poisoning wild dogs with strychnine, which appeared in your number for July last, as the method I employed proved successful.

I prepared an emulsion of strychnine, using about 10 grains of strychnine and a tumbler of water. Strychnine dissolves tardily, but a perfect solution is not required: it can be procured, however, by the addition of a small quantity of acid. This solution I injected into the carcass with a hypodermic syringe and in places stuck in my hunting knife and poured the solution into the wound.

By this method the poison got well distributed and not being on the surface did not arouse suspicion. I invariably found that animals that ate of the carcass died, and on one occasion the whole pack was found dead around the bait.

On several occasions the dogs had died after vomiting. I have never actually known a case of a dog surviving after vomiting, which is undoubtedly due to an over-dose of the poison; but it is quite conceivable that an over-dose might act rapidly on the stomach and by an immediate emission almost all the poison might be got rid off: such action is not unknown in the case of other poisons.

I think Mr. Witt will produce more than one vomit for 104 grains of poison ("oh monstrous, but one ha'penny worth of bread to this intolerable deal of sack") if he will dilute his poison and use far smaller doses. One-fourth of a grain is the maximum dose an adult man can take with safety, and this only after having been educated up to it by previously taking smaller doses.

I am unable to believe that the dogs Mr. Witt poisoned actually died and were carried off by their companions; to begin with, the vomit was found apparently at a considerable distance from the kill and the dog must have been alive when it vomited.

I can quite understand a mother of a dying cub trying to drag it away, but my experience of the pack is that they are singularly indifferent to the fate of their companions.

Mr. Witt's concluding note regarding dogs having actually attacked a human being is of great interest and probably the first record of such an extraordinary event having taken place.

Medical men are unfortunately unable to throw much more light on the question of strychnine poisoning than their lay-brethren as they are not in the habit of administrating fatal doses; I once, however, witnessed a doctor administer half a grain to an old dog. It expired in about 30 seconds.

A. A. DUNBAR BRANDER, I.F.S.

HOSHANGABAD, *6th September* 1907.

(*From "The Indian Forester," No. 9, Vol. XXXII, September 1907.*)

No. III.—THE BHUTAN TAKIN.

Sportsmen will be interested to learn that the Bhutan takin proves to be distinct from the typical *Budorcas taxicolor* of the Mishmi Hills, a circumstance which would naturally be expected, when we remember that the two areas are sundered by deep river gorges, which form, of course, impassable barriers to such highzone animals.

On a previous occasion reference was made in the *Field* to two pairs of takin horns from the upper part of the Chumbi Valley in Bhutan, sent to the British Museum by Mr. J. Claude White, Commissioner of Sikhim. These horns were then attached to the skin, and from the relatively small size of the larger pair I came to the conclusion that they respectively belonged to a cow and a calf. Subsequently the two skulls and skeletons reached this country, when I found, from the conditions of the teeth, that both animals were adults, although one was considerably older than the other. This suggested that they were really a male and a female, and this was confirmed, not only by the evidence of the skins, but by the testimony of Mr. White himself, who was in this country last summer. While the horns of the bull, as being much the older animal of the two, are blunted at the tips and worn smooth on the surfaces, those of the cow are sharply pointed and covered with rugosities.

Having reached this point, I felt convinced that the Bhutan takin was a distinct small-horned race, but thought it desirable to await further evidence before giving it a name. This evidence has now been supplied by the horns, skulls, and skins of a bull and cow from Bhutan, sent me for inspection by the Hon. Walter Rothschild. Fortunately, in this case, the bull is immature and the cow fully adult; so that the four pairs of horns collectively show all that is necessary, and demonstrate the distinctness of the race. In the adult bull the horns when entire would have been about 14in. or 15in. in length, against from 20in. to 24in. in the Mishmi race. In the young bull they measure 13in. against 18in. in a Mishmi specimen of about the same age.

I also find that in the Bhutan takin the light yellow area on the back is generally of smaller extent than in the typical race. This is of interest as indicating a gradual increase of the yellow as we pass from Bhutan to Tibet, *Budorcas taxicolor tibetanus* being wholly yellow on the upper-parts. Judging from the single immature specimen in the Museum, I am also inclined to think that the latter race will prove to be longer horned than the Mishmi takin.

For the short-horned Bhutan takin I think the name *Budorcas taxicolor whitei* will be appropriate, the type of the race being the bull in the British Museum, while the cow in that collection and Mr. Rothschild's two specimens will be co-types. It is now, of course, perfectly certain that the horns of the two sexes of the takin are alike in form, as was originally pointed out by Mr. A. O. Hume. I may add that a curious and apparently hornless ruminant skull from the Siwalik formation of the Himalaya, described many years ago by the late Professor Rutimeyer as *Bucapra daviesi*, appears to indicate a relative of the takin.

R. LYDEKKER.

(*The above is taken from " The Field " of 16th November 1907.*)

No. IV.—THE BALUCHISTAN GAZELLE.

Mr. Lydekker, in his *Game Animals of India*, says :—" Whether the Baluchi Chinkara is entitled to rank as a distinct race may be open to doubt, but as it has received a name, it may be alluded to as *Gazella bennettii fuscifrons*. It was originally named by Dr. Blanford in 1873 on the evidence of a female head obtained by Sir O. St. John at Jalk, in Northern Baluchistan. Its claim to distinction is that the horns of this sex are distinctly, although not very prominently ridged or ringed, and that the dark portions of the face are dark-brown instead of rufous. When the male was discovered, it was found not to differ perceptibly from the ordinary Indian chinkara, except that the horns are a little more curved backwards, and slightly more lyrate when viewed from the front. From Baluchistan the chinkara extends to the head of the Persian Gulf in the neighbourhood of Bushire. There it inhabits the low country, as it does in Baluchistan, not ranging above the 3,000 feet level, where it is replaced by the goitred gazelle, easily recognised, even at a comparatively long distance, by its lighter colour."

This appears to raise questions which perhaps the Baluchistan Natural History Society will clear up. The sub-specific status given to the Baluchistan Gazelle by reason of the form of horns of the female is certainly incorrect, for the female chinkara of the Deccan has distinctly annulated horns. As regards the colour of the face and the shape of the horns of the male, these also seem to be fallacious reasons, for colour and form of horn vary in animals shot out of one herd. Naturalists are surely too prone to establish sub-species. It is not clear whether Mr. Lydekker means that the chinkara does not range above 3,000 feet in Baluchistan, but I have seen them in that country at an elevation of 4,700 feet.

SIMLA, *January 15th*, 1908. R. G. BURTON.

NO. V.—MAJOR KENNION'S WILD SHEEP

Three of the heads of the wild sheep obtained by Major R. L. Kennion near Bujnard, Persia, previously referred to in the *Field*, March 30, April 6, and July 30, are now mounted, and one of them has been handed over to the British Museum by Mr. Rowland Ward. As Bujnard is situated in the valley lying between the Ala Dagh on the south and the Kopet Dagh on the north, it was from the first practically certain that the sheep would turn out to belong to the Kopet Dagh race of the urial (*Ovis vignei arkal*). As the result of a comparison of one of Major Kennion's specimens with a skull and horns from the Kopet Dagh presented to the museum some years ago by Mr. St. George Littledale, this is now definitely proved to be the case, both examples showing the peculiarly wide, flat, and sparsely ridged front surface of the horns distinctive of that race. The horns of the two finest of the Bujnard rams are very large, forming rather more than a complete circle. The white ruffs of the same two specimens are also very large—larger and more wholly white, I think, than in any other race of the urial. In this respect these sheep differ very markedly from *Ovis orientalis*, which occurs on the south side of the Elburz range, near Tehran, the ruff in all the specimens of that species which have come under my observation being comparatively small, and chiefly composed of black or blackish hairs on the lower part of the throat. I may have something to write about a gazelle head obtained by Major Kennion on a subsequent occasion.—

R. L.

(*The above is from " The Field " of 28th December* 1907.)

NO. VI.—SHEDDING OF THE ANTLERS OF THE MUNTJAC OR BARKING DEER (*CERVULUS MUNTJAC*).

In the *Field* of 13th July there was an enquiry over the initials R. L. for any information "as to whether Muntjacs shed their antlers annually or at irregular intervals." This enquiry was prompted by the worn appearance of the antlers of a head that the writer had examined in London of a Chinese Muntjac (*C. lacrymans*), which pointed to the unlikelihood of the antlers having become abraded and polished within a period of less than twelve months to such an extent that the surface resembled an ivory tusk, if they are shed annually. Definite information is appealed for on this point and perhaps some of our members can help to settle it so far as our Indian species is concerned. In the *Field* of 27th July Mr. Claud Alexander stated that a live specimen of the Indian Muntjac in his collection, which he had had for two years, certainly shed its antlers annually about the end of June, and suggested that the condition of the horns of the specimen in question was "probably due to youth or old age or possibly to the animal having been in low condition at the time the horns were growing." Mr. Alexander's evidence is conclusive enough so far as an animal in captivity in Europe is concerned, but it would be interesting to get it corroborated from observations of the Muntjac in its natural wild state.

KARACHI, *20th August* 1907. E. COMBER.

[Since the above was written, the following further note on this subject has appeared in the *Field* of 7th September 1907.

SHEDDING OF HORNS BY MUNTJAC.

In your issue of July 13, R. L. seeks information as to the shedding of horns by muntjac deer. Of the Chinese deer I can say nothing. I do not know whether they are of a different species to our Indian "ribfaced" or "barking" deer, but of the latter I can speak from an experience of many years, in which I have annually preserved and hunted them. My opinion is that all (or very nearly *all*) invariably shed their horns annually. Some few retain them as late as the end of May. The largest horns I ever got in that month were just about to drop off, and it is possible those R. L. mentions were retained as late as this, and might have been unusually fine. Horns which I believe in these districts and round Darjeeling are not shed, are most peculiar and if R. L. cares to write to me I will gladly send him one of those I have. They are merely sharp, straight, or slightly curved spikes of horn, perhaps 1½in. long. My men here, who have for years hunted with my dogs, maintain these are never shed, and I am inclined to believe them. These deer appear more savage than the others; they often injure the dogs with their "teeth," more often than the other kind I think; but this may be only our fancy. I imagine some constitutional defect has prevented their horns from growing, but the deer are just as large as the others. The natives all maintain they are different —a separate "jhat." I do not think it. Fortunately, they are comparatively scarce.—E. R. Durnford (Fagu, P.O., Western Duars, E. Bengal).]

No. VII.—THE ANAMESE SEROW.

Very little is known in this country, so far, at least, as actual specimens are concerned, with regard to the big game animals of Anam and Tonkin, and some interest therefore attaches to the skin and skull of a serow brought from the former district by Dr. J. Vasall, and presented by him to the British Museum. It indicates an immature, and apparently female specimen. The late Père Heude (in a work published at Shanghai) described a number of skulls and skins of serows from Tonkin, but, unfortunately, instead of regarding all as pertaining to a single species, gave them no less than six specific names. Under these circumstances, the only course is to take the first of the names, *Nemorhædus* (or *Capricornis*) *marcolinus* for the Anam-Tonkin animal. From the

evidence of the new skin and Père Heude's figures, it appears that this species differs from the Sumatran and Himalayan serows in the dark colour of the back and sides, which extends downwards on the legs more or less completely to the knees and hocks. In the new specimen the general colour of the upper parts is black mingled with rufous, but in some of Père Heude's figures the coat is represented as almost completely black, while in one some white is shown in the mane. The Anam animal is of considerable interest as helping to complete the transition from the Himalayan serows, in which the limbs are chestnut above and dirty white below, to the Malay serow, in which they are wholly black, and thus serves to confirm the view that all these serows are local forms of one variable species. The white-maned Chinese serow, it may be added, forms another connecting link, having the dark area reaching to the knees in the fore-limbs, but the hind limbs, wholly rufous.

(*The above is taken from the "Field" of 16th November* 1907.)

No. VIII.—MALFORMED SAMBAR HORN.

The accompanying photograph is that of a Sambar head which a Danish Gendarmarie Officer had in his possession and which was obtained from the North of Siam.

The head was being sent away to Denmark so that I had no time to take measurements, &c., and was only able to photograph it.

E. W. TROTTER,
Acting Commissioner of Police.

BANGKOK, SIAM, 10*th November* 1907.

No. IX.—DO WILD ANIMALS EVER DIE A NATURAL DEATH ?

This is a question which has engaged my attention for several years past, and it has puzzled me not a little. I am at last persuaded to send these few remarks by noticing that in Vol. XVIII of our Journal, on pages 125 and 213, both Lt.-Col. Caton Jones and Mr. D. O. Witt ask :—"Do Wild Dogs carry off their dead and bury them? " I am induced to put my question because, though I have knocked about in the wilds for nearly forty years, I can only remember to have come across one dead animal myself, while my questioning of others has never elicited an answer in the affirmative; and I have asked hundreds of persons, entirely Europeans, not the Natives of the jungles. Most people will say,—"Of course they die natural deaths, they are subject to diseases as men are and cannot live for ever. They must go away into inaccessible places where man cannot go." It is natural to suppose this, but what inaccessible places can deer get away to?—and also I ought to say antelope? Where can Blackbuck go to? and they swarm all over the Indian Plains in hundreds. Has any one ever come across a dead Blackbuck? No. Then what becomes of them? Surely if they die natural deaths some one must come across one now and again.

Some will say "Vultures and animals eat them as soon as they die." Has any one ever come across Vultures feeding on a dead *wild* animal? I never have.

I think we must look for the answer somewhere else. My idea is that nature has endowed all wild animals with such properties as enable them to take care of themselves as long as their powers remain unimpared. Directly these powers begin to wane, whether from disease, old age or other causes; some other animal comes across them and kills and eats them straight away. I am aware that there are many things that could be urged against this theory, but I am anxious to start a discussion in this journal before I leave India for good and to see what the result may be. That dead wild animals are not found in places, where the live animals abound is one of Nature's mysteries. Let us see if we can get, if not quite to the bottom of it, at any rate some good way down. As I have said before I came across a dead Sambhar in the Kanara Forests. It was a hind and a much smaller hind was lying down beside it. I could not understand why they did not both get up and run away, for it was very evident as we came up to them that the younger hind both heard and saw (and possibly scented) my shikari and myself, but it did not get up and bolt until we came within a few yards, and even when it did go, it only went a short way off and evidently waited for its companion. When we got closer we found the bigger hind dead and cold. The two had evidently gone in the morning to the place where we found them and the elder one had quietly passed away. The younger one would not run from us, for she was under the protection of the other and was waiting for her companion to get up. It was between four and five in the evening of an April day when we found the dead hind. There was apparently nothing wrong with her, but when we skinned her, we found two marks just above the fetlock joint of her fore feet which looked very much like those left by the poison fangs of a cobra. It got dark before we had time to examine her internal organs to see whether they were all right, and before next morning jackals or something of the kind had finished off what was left of her. While we were skinning the dead animal the living one slipped away.

W. G. BETHAM,
Divisional Forest Officer.

AHMEDNAGAR, 30*th December* 1907.

[Mr. W. G. Betham writes on the 23rd March 1908 as follows:—

"I should like to add that, a few days back, in a country thick with black buck I was talking on the subject to some of the country people, and their answer was 'we cannot tell what becomes of the animals. When wolves run off with a sheep or a goat, we almost always find traces of the dead animal, a foot or a bit of skin or something, but we never come across any such remains of antelopes.' and I can corroborate this from my own experience. I have often come across the remains of goats and sheep carried away and eaten by wolves, but never anything that could be identified as the remains of an antelope. It is really most extraordinary what becomes of them. One ought to come across a horn now and again, but I never have and I have never come across anyone who has, *i.e.*, the horn of an antelope either Black Buck or Chinkara, in the open plains. Horns of sambhar (or rather antlers) and of cheetal are frequently picked up. It would be interesting to know if anyone has ever picked up the horns of a Black Buck or a Chinkara? I fancy that my facilities for picking them up have been as good as any man's."]

No. X.—NOTES ON NIDIFICATION OF VARIOUS BIRDS IN THE UPPER CHINDWIN AND AT MAYMYO, UPPER BURMA.

No. 67.—White-browed Laughing Thrush—(*Dryonastes sannio*).—This bird fairly swarms in and around Maymyo. The only other Laughing Thrush found here appears to be

No. 73.—Necklaced Laughing Thrush—(*Garrulax moniliger*) which is scarce. I found numerous nests during May 1907: they are placed usually in low bushes, often wild raspberry bushes are chosen, near the ground as a rule, and there is little attempt at concealment. The nests are rather untidy, made of coarse grass and roots, and occasionally small twigs, and lined with finer leaf stalks and roots. The normal clutch appears to be three and the eggs vary from pale blue to pure white, the blue eggs being much less common than the white ones.

No. 228.—Swinhoe's White-eye—(*Zosterops simplex*).—I found three nests of this little bird, two during May and one in July 1907 at Maymyo. The first two contained two, and the last one three, eggs. The first one found was practically inaccessible, and the egg got broken; the other two were in low bushes.

No. 958.—Northern Pale-headed Woodpecker—(*Gecinulus grantia*).—A nest, containing three fresh eggs, was taken from a hole in a small hollow tree on 21st March 1907. The nest hole was only about 3 feet from the ground: elevation 2,500 feet, Upper Chindwin.

No. 1045.—The Black-capped Kingfisher—(*Halcyon pileata*).—These birds were not uncommon in the Myittha Division, and I saw them on several occasions. On 14th April 1907, I obtained a single fresh egg from a hole about 18 inches in length in a sand bank.

No. 1092.—European Nightjar—(*Caprimulgus europæus*).—Two eggs, not quite fresh, and the parent bird at Maymyo. 16th May 1907.

No. 1096.—The Great-eared Nightjar—(*Lyncornis cerviniceps*).—I got four nests of this bird in the Myittha Division. The first egg was received on 15th March 1907, and was brought by a coolie, who said he had found two, but broke the other ; it was hard set. A second single hard set egg was brought me by a coolie on 17th March ; he said there was only one egg and at the time I did not believe him, but on 20th March I got a single hard set egg myself and shot the hen bird ; on dissection, I found that she did not contain any egg larger than a pea ; so there is not the least doubt that the bird incubates one egg. On 27th March I received a single fresh egg but was not able to shoot the bird. I was also informed that a single fresh egg was found in January, and eaten by the coolies. Major Evans informs me that he once found a nest with three eggs.

No. 1142.—Burmese Slaty-headed Paroquet—(*Palæornis finschi*).—I took a nest, containing 4 eggs in various stages of incubation from a natural hollow in a *Xylia dolabriformis* (Pyinkado tree), about 40 feet from ground on 10th March 1907, in the Myittha Division, Upper Chindwin.

J. C. HOPWOOD, I.F.S.

KINDAT, UPPER CHINDWIN, *November* 1907.

No. XI.—NESTING OF THE INDIAN GREAT REED WARBLER (*ACROCEPHALUS STENTOREUS*) IN INDIA.

While on a large jhil in the Bahraich district on August 14th I was much surprised to hear the unmistakeable harsh note of *Acrocephalus stentoreus* (the Indian Great Reed Warbler) sounding from several directions, and on searching round about wherever the birds were calling, several nests with young and at last, three nests with fresh eggs, were discovered and the birds secured. The nests were all placed rather low down, within three feet of the water, in more or less detached clumps of reed inside very dense reed beds and seemed to be somewhat smaller and made of finer (or less coarse) grasses than those I have seen in Kashmir. The birds too are somewhat smaller, measuring 7·3 in length against 7·7 as given in Oates and Blanford, but in other respects such as wing and bill measurements and colouring agree perfectly with their description, and the eggs resemble those I have taken numbers of in Kashmir.

I should be glad to know if this bird has been recorded before as breeding in India, as although abundant in Kashmir in summer and also reported from Sind I am not aware that it has been obtained except as a cold weather visitant or occasional summer straggler in Upper India ?

S. L. WHYMPER.

JEOLIKOTE, *August 31st*, 1907.

No. XII.—NOTES ON THE MANIPUR BUSH-QUAIL (*MICROPERDIX MANIPURENSIS*) IN CAPTIVITY.

The Manipur Bush-Quail (*Microperdix manipurensis*, Hume) is a rare bird found in the Manipur State, in the Duars, and probably in other places towards the Eastern Frontier of India. The fact that it lives usually in long elephant-grass accounts for the difficulty experienced in obtaining specimens. Even the natives do not appear to recognize the bird. It was originally discovered by Hume in Manipur, though it is said that a single specimen existed in the British Museum before this, and was supposed to have been obtained in Bhutan. An interesting description of the shoot in which Hume obtained several specimens is to be found in "The Game Birds of India" (Oates), Part I., page 107. "Once, and once only," writes Hume, "did I meet with this species, and that was at the base of the hills in the South-Eastern portion of the Manipur plain." A good description of the bird can be found in the same book, the most obvious characteristics being the olive-grey upper plumage, each feather being fringed and barred with black in both male and female. The lower plumage is buff, each feather having a black cross, made up by a black shaft and a transverse band. The irides are brown, the legs orange, and the bill horn-coloured. In this Journal Vol. XV., page 527, there is a note by Lieut.-Col. H. B. Thornhill of a female specimen obtained by him at Alipur, Duar, in 1885-86. It was by the kindness of Mr. Comber that my attention was drawn to this. I know of no more recent reference to this quail.*

While stationed in Manipur in 1905-06, I was naturally keen on obtaining a specimen; and though on several occasions I put up a quail in long grass, which I thought to be of this variety, it was not till March 4, 1906, that I was lucky enough to catch a female bird. Some of the other birds I saw appeared a good deal darker than the Manipur quail, and were smaller. They probably belonged to some other unknown species of bush-quail, but I never succeeded in getting a specimen.

It was a few hundred yards off the Pukhao Road, thirteen miles N.-W. of Imphal (the capital), that I obtained my specimen. Four of us were after deer and small game, burning long grass and beating. During our last burn a quail flew out of the long grass, and settled a short way off in the open. I sent a beater after it, and after another short flight he succeeded in catching it. I at once saw it was a species new to me, and guessed it was a female Manipur quail, and this turned out to be the case. Probably the bird was, to some extent, overcome by the smoke. I took the bird home wrapped in a handkerchief, and then put it into a small cage. Next morning I was glad to see it alive, and, though very nervous and frightened, it readily ate grain and drank water. I kept this little bird alive for nearly a year, and got quite fond of it, till one night (February 9, 1907) it died suddenly in its cage at Dehra Dun. She had been in excellent condition and spirits the day before, and even a careful *post-mortem* revealed no obvious cause of death.

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* In June 1907 Mr. C. M. Inglis sent our Society an interesting note on this quail which has unfortunately had to be kept back, because it is desired to have a coloured illustration of this bird to appear with it in the Journal. This necessitated writing out to India and obtaining more specimens of the quail before it could be figured. It is hoped that the illustration will be ready shortly.—EDS.

As far as I know, this variety of quail has never been kept in captivity before, so some details of its habits and ways may be of interest. At first I kept it in a basket roofed over with trellis-work. Pounded "dhan" or rice formed her staple diet, and she always ate readily. Later on I tried her with ordinary millets and canary seed, and she ate these as greedily. I soon found that she had a great liking for insects, and every day I would catch something, and she soon learnt to take them from between my fingers. Spiders, flies wasp larvæ, etc., were all alike delicacies to her, and I witnessed many an exciting chase when an insect attempted to escape in the straw in the bottom of the cage. When a larger insect than she cared to tackle, such as a large beetle or even a cockroach, was let loose in the cage, she was greatly concerned, and kept well out of the way until the objectionable creature had taken its departure. One night a mouse entered the cage to steal some of the grain, and gave the poor little bird a dreadful fright. I was at once awakened by her fluttering, and I found that she had parted company with half of her back feathers in her attempts to escape.

It was a red-letter day for her when I substituted dry earth for part of the straw in her cage. She almost outdid the domestic chickens in her scratchings and peckings. Never before did a few handfuls of dry earth afford such joy. After an hour's pecking, it was the height of bliss to lie in the sun on one side with the uppermost leg and wing stretched out and to indulge in a quiet nap. Of course, in these characteristics she exactly resembled most gallinaceous birds.

It was wonderful how well the bird got to know me, and knew my voice and whistle quite well. If left alone, she was generally restless, and, curiously, was much quieter if the cage was hung up out of harm's way. I suppose she missed not being able to take cover while in the cage on the ground. I was quite surprised when I first heard her note. It was a loud, clear ringing, which could easily be heard a hundred yards off. I can imitate it fairly well by whistling, but it is hard to reproduce it in writing. If the following is whistled, it will give some idea of the cry: "Whit—it—it—it—t—t." Each "it" is slightly higher in tone, and they tend to run into one another at the end. The cry is generally repeated three or four times, and each time the note becomes louder and higher. It is a beautifully clear, shrill and characteristic whistle. After securing this specimen, I several times heard the whistle in long grass in Manipur, and I have no doubt I should have secured several specimens if I had remained longer there. Without knowing the cry of this quail, it is only by accident that one can obtain a specimen, owing to its extreme shyness and its fondness for living in very long grass.

When eating, this bird utters a very subdued, soft whistle, repeated at each peck, much like the "it" of its usual cry, but much softer and lower. The whistle is louder and more excited when the bird is pecking at an insect it relishes, such as a toothsome green caterpillar (rescued from a living death in a wasp's mud nest).

I should very much like to know the note of the male bird, and, being such a pretty little bird, it would make an excellent pet.

I hope the above brief notes will be of some interest. A knowledge of the bird's cry should certainly help those who have the opportunity of visiting its habitat in obtaining more specimens of this rare bird. I have sent the specimen described here to Mr. Ogilvie Grant, of the British Museum.

F. POWELL CONNOR, CAPTAIN,
I.M.S., F.R.C.S.

MEDICAL COLLEGE,
CALCUTTA, 12*th August* 1907.

No. XIII.—A NOTE ON THE DISTRIBUTION OF THE BURMESE GREY DUCK OR SPOT-BILL (*POLIONETTA HARINGTONI*, OATES).

On page 558, Vol. XVII, of the Journal of the Bombay Natural History Society, Mr. E. W. Oates described a new species of grey duck from Upper Burma, to which he gave the above title.

For the convenience of those readers who have not the above quoted number at hand I give Mr. Oates' description below :—

"Similar to *P. pœcilorhyncha*, the Spot-bill or Grey Duck of India, but constantly wanting the orange coloured patches which adorn the base of the upper mandible of that species. The bill is, moreover, much smaller, measuring two inches from the point of the forehead to the tip of the nail, against two and a quarter inches in *P. pœcilorhyncha*."

On page 437, Vol. IV, of the " Fauna of British India," Birds, Blanford gives the length of the bill as 2·5. Oates gives the distribution of the new species as " the valley of the Irrawaddy river and the Shan States " and adds Toungoo, Tandawgyi on the Pegu river, and Thatone as probable localities, Major Evans having shot grey duck there. In November 1902, I obtained some grey duck in the Meiktila district, near Thazi on the Rangoon-Mandalay railway. I noticed at the time that these duck had the patches at the base of the bill black and not orange, my attention being drawn to the fact owing to my having recently seen a plate of *P. pœcilorhyncha*, showing the orange patches. At that time, however, I had not commenced studying the Burmese birds, and assumed that the orange colour was put on in the breeding season. In the cold weather of 1905-06, I did a good deal of duck shooting in the Upper Chindwin, above Kindat. About a dozen grey duck were killed, all but one having black patches at the base of the mandible : the one exception, killed about February 15th, 1906, had these patches *pure orange*.

At the end of October 1907, I was again out duck shooting in the same locality, and obtained fifteen grey duck. Of these, no less than four had the orange patches of *P. pœcilorhyncha*, but in every case *the orange mark had a black centre*, the amount of black varying in the different specimens. I very much regret that I did not measure the length of the bill, but I had forgotten at the time that the small bill was one of the characters by which the new species is distinguished from the old.

Now a species of grey duck, presumably *P. haringtoni*, breeds in the Upper Chindwin: I have personally seen pairs of these duck in June, July, and September, and have heard of broods of young ones and of nests having been found, though personally I have not been fortunate enough to see the young birds or secure the eggs; and I have shot a duck, presumably *P. pœcilorhyncha*, in February in the same locality: it would appear to me, therefore, that *P. pœcilorhyncha* and *P. haringtoni* occasionally pair, and produce a hybrid with the spots at the base of the mandible partly black and partly orange, or else that *P. haringtoni* is merely a geographical race or sub-species of *P. pœcilorhyncha*, and occasionally reverts to the typical species.

It is, perhaps, presumptuous of me to question a species created by so eminent an authority as Mr. Oates, more especially as I foolishly omitted to take measurements of the bill; but against the five specimens examined by Mr. Oates, I have now obtained four with mixed black and orange patches.

I shall now endeavour to obtain some more specimens from the Upper Chindwin with either pure orange or variegated patches, and if I am successful in so doing they will be preserved and forwarded to the Bombay Natural History Society.

Since writing the above, I have shot a male wigeon at Kindat, the only one I have ever seen or heard of from the district.

J. C. HOPWOOD.

KINDAT, UPPER CHINDWIN, 9*th November* 1907.

No. XIV.—NESTING OF THE RUFOUS-BELLIED HAWK-EAGLE.

I read with much interest Mr. Kinloch's letter on the nesting of the Rufous-bellied Hawk-Eagle (*Lophotriorchis kieneri*) in the Journal published on the 29th June last.

Last year an egg was sent to me by one of my people which had been taken on the 16th February 1906 which I could not identify. The description of the bird was simply that it was an eagle, that the nest was in a tall tree, and that it contained only one egg, which was very much incubated. I sent it to Mr. Stuart Baker with a list of all the Eagles that have been found in Travancore, and he replied that he had no eggs exactly similar to it and that it was probably the egg of *Lophotriorchis kieneri*.

It will be interesting if Mr. Kinloch succeeds in getting the egg of this bird as he hopes to do, and if it proves to be similar to the egg which has been brought to me or not. The following is a description of it :—

Dirty white, rather rough, speckled and spotted all over with grey, brick-red and dark brown, the spots forming a cap at the larger end.

Size 2·65 inches × 1·85 inches.

T. F. BOURDILLON.

QUILON, TRAVANCORE, *13th August* 1907.

No. XV.—NOTE ON THE BEARDED VULTURE (*GYPAËTUS BARBATUS*) OR "LAMMERGEYER".

I am sending for the Museum the stuffed head and neck of the Bearded Vulture or Lammergeyer. I shot this bird on the 22nd of last month as it was trying to capture one of my fowls. I was so much pressed for time, I am sorry to say, that I was unable to preserve the entire bird. The specimen I send however is a very good one. The head, neck, and bill with the distinguishing beard, all show well, the plumage being in good order.

This bird was a female, and its measurements agreed exactly with those of Jerdon's which give length four feet, expanse of wings nine-and-a-half feet. On dissecting it, I found two half developed eggs on which no shell had yet formed. According to Jerdon it lays in April or May.[*] The bird must have been feeding recently on a Gooral, for I found a quantity of Gooral hair in its stomach, and also the fractured shoulder blade of the same beast. Jerdon says, in his description of the Bearded Vulture, and its habits : "It is said to hurl Chamois, and even the Himalayan *Ovis ammon* off precipitous cliffs by a sudden swoop, and to feed on the mangled carcases." He adds that in the stomach of one killed by him in Kashmir he found several large bones, together with the hoof of an Ibex.

The statement that the Bearded Vulture hurls animals over the tremendous precipices of the Himalayas is, I think, proved by the fact that the Gooral's shoulder blade I found in the stomach of the bird killed by me was broken in two pieces, as though from a fall, for it is impossible that the bird could have done this with its bill.

It is probable that the Lammergeyer keeps a good look out for such animals as may fall, or be thrown over the precipices of the mountains which it frequents. I remember a sad accident which happened a few years ago, when two officers were shooting on the Himalayan ranges. One of them was following up a wounded bear which suddenly charged, knocking him, and his shikari over the precipice, the impetus of the charge carrying the bear over as well. His companion who was observing all this from the top of the mountain, and who told me the story of the accident very shortly after it happened, mentioned that it took him about four hours to get down to the foot of the

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[[*] According to Blanford (Fauna of British India, Birds) the "Lammergeyer" breeds "in the Himalayas from November to March."—Eds.]

precipice, and there he found the three bodies shattered almost beyond recognition. He added that the Lammergeyers had already got at them.

W. OSBORN, Lieut.-General, I.A.

Naggur, Kulu Punjab, 12th January 1908.

No. XVI.—REMARKS UPON THE SNAKE *CONTIA ANGUSTICEPS*.

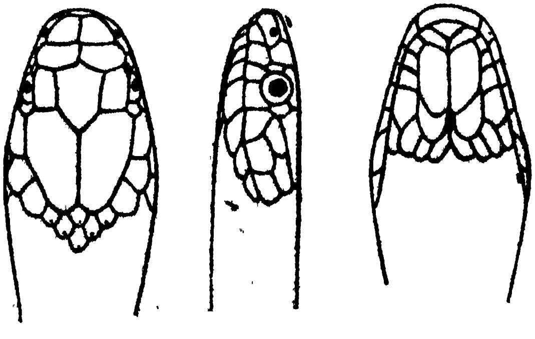
I am much indebted to Mr. R. A. Spence who has submitted for my examination two specimens of the little snake *Contia angusticeps* sent to the Society's collection by Sir H. McMahon, with the request that I would write a description of this little known snake. Reference to Mr. Boulenger's Catalogue (Vol. II, 1894, p. 262) shows that at the time he wrote a single specimen only was known which was in the Indian Museum. This was sent to him for inspection by Mr. Sclater. His earlier work Fauna. Brit. Ind.—Reptilia and Batrachia (1890) made no reference to this snake. The specimens sent to Mr. Boulenger was procured from Cherat, Baluchistan.

Since this from 1899 to 1900 Sir H. McMahon acquired eleven specimens in the Malakand, and he says in a letter addressed to this Society: "This little snake is fairly common in one restricted locality, *i. e.*, the hill slope a few yards below and N.-W. of the Political Agent's house."

A brief allusion to these specimens was contributed to this Society by Sir H. McMahon himself which appeared in our Journal Vol. XIV, page 181.

Some of these specimens were given to the British Museum. The only examples I saw there in 1903 were 3 in number and all presented by Sir H. McMahon. In 1904 Dr. N. Annandale made a brief allusion to 5 specimens in the Indian Museum received from Sir H. McMahon, and he figured one (Plate XI, fig. 1) in the Journal of the Asiatic Society of Bengal, 1904. He mentions here that the type specimen has been lost.

The only other specimens I know of are the two now submitted to me.



Contia angusticeps
from a specimen Ut
(× 4 times)

For those who have not access to Mr. Boulenger's Catalogue I venture to describe the snake again.

Rostral: Touches 6 shields, the sutures it makes with the anterior nasals rather greater than with the internasals, nearly twice as long as those made with first labials. *Internasals*: A pair; the suture between them rather longer than that between the præfrontal fellows; about three-fourths the internaso-præfrontal suture. *Præfrontals*: A pair; the suture between them about two-thirds the præfronto-frontal suture; touching the internasal, nasal, loreal (when present; if absent the 2nd supralabial), præocular, supraocular, and frontal. *Frontal*: Touches 6 shields; the sutures it makes with the supra-oculars one quarter greater than with the parietals, one-third to one-quarter greater than with the præfrontals. *Supraoculars*: Length about three-quarters the length of frontal; breadth about half the breadth of the frontal. *Nasals*: Entire, with the nostril situated rather above, and behind the mid-point of the shield; touching the 1st and 2nd supralabials. *Loreal* if present very small, frequently absent being united with the præfrontal. *Præoculars*: One; not reaching the crown. Eye with vertically elliptical pupil. *Postoculars*: One. *Temporals*: One, touching the 5th and 6th supralabials. *Supralabials*: 7; the 3rd and 4th touching the eye; 5th, 6th and 7th largest, subequal. *Infralabials*: 5; the 5th or 4th and 5th touching the posterior sublinguals; the 5th largest, broader than the posterior sublinguals, and touching two scales behind. *Anterior sublinguals* larger than posterior. The 1st infralabial suture one-fifth to one-sixth the suture between the anterior sublinguals. *Costals*: 2 heads lengths behind head 15, midbody 15, 2 heads lengths before vent 13. In the step from 15 to 13 the 3rd and 4th rows above the ventrals blend.* The last row, and the vertebral row are not enlarged. Apical pits are present, and single. Keels absent. *Ventrals* evenly rounded, broad, the last costal row only being visible in part on either side. *Anal* divided. *Subcaudals*, divided. Head depressed, body elongate, cylindrical, tail moderate. *Colour* pale dun brown, nearly uniform dorsally, but if inspected closely the edges of the scales are seen to be lighter. The head has two dark cross bars, one between the eyes, one in the middle of the parietals, and a broader bar nuchally, behind which some specimens have a row or two of transverse spots. Sir H. McMahon says that in life these marks are black, but soon fade in spirit. The belly is dirty whitish, and unspotted.

Remarks.—It is to be noted that Mr. Boulenger mentions the presence of a small loreal, but in one of the three specimens I examined in the British Museum this shield is absent, and it is absent in both the specimens just received. The ventrals and subcaudals in the five specimens examined by me are as follows:—

196 + 77, 185 + 81, 196 + 66, 201 ? + 72, 182 + 81.

This snake is interesting from the point of view of distribution. According to Mr. Boulenger's Catalogue there are 21 known species of *Contia*. Twelve of these are only known from North America, 1 from South America and 8 from Asia; 7 of these are however only known from Persia and further West. The remaining one, *viz.*, *angusticeps* is known from Baluchistan, and the N.-W. Frontier of India (Malakand). It is one of the smallest snakes that occurs within our Indian limits. The longest record is 15 inches, and though there are a few snakes shorter in adult life I am not aware of any that are more slender excepting perhaps *Typhlops braminus* and *Callophis trimaculatus.*

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* In one specimen before me the costals are aberrant. The 3rd row above the ventrals subdivides, the resulting two rows again coalescing and dividing again. The rows are thus irregular in the second fourth of the body numbering 17 and 16 in places.

Sir H. McMahon says "In life this little snake is most active and lively, and assumes a most pugnacious attitude when teased."

F. WALL, MAJOR, I.M.S., C.M.Z.S.

DIBRUGARH, ASSAM, 28*th July* 1907.

No. XVII.—NOTES ON THE INCUBATION AND BROOD OF THE INDO-BURMESE SNAKE-LIZARD OR SLOW WORM (*OPHISAURUS GRACILIS*).

On the 10th of September a cooly in Shillong brought me a female slow worm (*Ophisaurus gracilis*) with 5 eggs with which she was reported to have been found, but knowing that the European Slow worm (*Anguis fragilis*) is viviparous in habit I was inclined to be sceptical.

The eggs, much sullied by the soil beneath which they were deposited, are probably originally white. They are soft shelled, and the investment much like white kid. The poles are isomorphous, and the dimensions of one egg typical of the rest are $\frac{19}{24}$ × $\frac{13}{24}$ of an inch.

One egg was opened, and a living embryo extracted which measured 4¾ inches, the tail accounting for 2⅞ inches. On the 19th of September one egg hatched, the youngster measuring 4⅛ inches, the tail 2¾ inches. On the 18th another of exactly similar proportions emerged, and the last which hatched appeared on the 20th and was 4¾ inches long. The hatchlings are lively little creatures betraying some timidity but making no attempt at self-defence. In colour they are very different from adults. The prevailing hue is a pinkish-buff or dove colour with a metallic sheen. A conspicuous black band originating in the lore and passing through the temporal region is continued along the side of the body to the tail tip. The nostril is black. A fine black line originating beneath the eye passes along the lower lip and extends as far back as the vent. Behind a median nuchal black spot three series of smaller black spots progressively diminishing in size pass down the dorsum, the median row being continued well on to the tail. The beautiful metallic blue dorsal marks seen in adults are conspicuously absent.

Investigation proved that these little creatures are endowed with the same means of escape from the egg as young snakes. As I had young snakes of *Tropidonotus piscator* hatching contemporaneously I was able to compare the two.

In the slow worm the tooth in profile is seen to project more than in the snake. It also has a very decided inclination downwards, whereas in the snake there is little or no such inclination. The shape of the tooth is very different in the two creatures. In the slow worm the cutting edge is chisel-like, but in the snake a broad shallow deficiency in the median line bisects the edge, and renders it bidentate. The two are shown side by side in the accompanying figures.

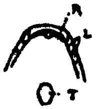

Fig 1

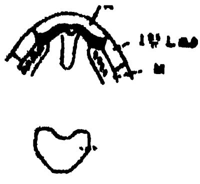

Fig 3

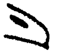

Fig 2

Fig. 1. Roof of anterior part of the mouth of *Ophisaurus gracilis* showing the fœtal tooth as a white speck in the median line. (Enlarged). R=rostral. L=labials. T=the tooth shown still more enlarged.

Fig. 2. Aspect of the fœtal tooth in profile in *Ophisaurus gracilis.*

Fig. 3. Roof of mouth of *Tropidonotus piscator* enlarged showing fœtal tooth in situ. R=rostral. M=maxilla. T=fœtal tooth enlarged.

I find that the oviparous habit of this lizard is not a new observation, but was elicited by Major G. H. Evans, and reported in this Journal (Vol. XVI, p. 171).

Ophisaurus gracilis is an extremely common lizard about Shillong, and frequently dislodged, as I understand from my snake collector, when overturning stones. It is a perfectly harmless creature making no attempt to defend itself when grasped, though it strives to evade capture, and often cleverly succeeds where broken ground favours its slippery tactics.

Like its European ally, its only means of defence appears to lie in the tail, which it very readily detaches, and leaves wriggling in a most uncanny fashion in the grasp of its would-be captor. The length of this appendage is considerably greater than the rest of the creature when perfect, but a very large number of specimens are brought in an imperfect condition with stunted tails in various stages of regeneration, or just recently detached.

It is eminently a denizen of hilly tracts though I notice Boulenger* records it from Eastern Bengal and Rangoon. Evans,† with a very long experience of Burma, and of Rangoon particularly, has never secured a specimen except at altitudes from 2,500 to 5,000 feet. Similarly though it is so common in the Khasi Hills I have not seen or heard of a specimen in the plains of Assam (about Dibrugarh). It is noteworthy too that the Chinese species *Ophisaurus harti* described and figured by Boulenger in 1899‡ was obtained at altitudes varying from 3,000 to 4,000 feet.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

DIBRUGARH, ASSAM, *October* 1907.

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* Fauna, Brit. Ind. Rept. and Batrach., 1890, p. 151.

† Loc. cit.

‡ P. Z. S., p. 160.

No. XVIII.—VIVIPAROUS HABIT OF THE COMMON INDIAN SKINK (*LYGOSOMA INDICA*).

I am not aware if this lizard is known to be viviparous, but a specimen was brought to me on the 19th of August in Shillong so extremely distended that it was obvious some event of a domestic nature was impending. When cut open, 9 perfectly formed young were found crowded together and completely occupying the abdominal cavity. One of these measured 2¾ inches, of which the tail accounted for 1½ inches.

This lizard is extremely common about Shillong, and I frequently saw it abroad, and on many occasions disturbed it from beneath stones. I saw many young, evidently this year's progeny in August and September, of a length similar to, or little greater than, the unborn embryos referred to above.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

DIBRUGARH, ASSAM, *October* 1907.

No. XIX.—REMARKS ON THE AGAMOID LIZARD (*PTYCTOLÆMUS GULARIS*).

Reference to Boulenger's work, Fauna of British India, Reptilia and Batrachia (1890, p. 117), makes it appear that this lizard is extremely rare, since he remarks that only two specimens at that time were known—one (the type) in the Berlin Museum, said to be from Calcutta, and a solitary specimen in the British Museum from Sadiya, Assam.

I was much surprised, therefore, when I found it an extremely common species about Shillong, Khasi Hills (4,900 feet). I collected many specimens which have been sent to the British Museum and our Society's collection.

Sadiya, I may mention, the reported habitat of the solitary British Museum specimen (in 1890), is on the north bank of the Brahmaputra, within a few miles of the Himalayas, so that it is probable that the eastern ranges of these Hills are within the limit of its distribution. Calcutta as a habitat, I think, requires confirmation. The folds in the throat from which the specific name of this species is derived are not black in life, but a very beautiful deep ultramarine, and the scales in the folds are minute and regular, giving an appearance of velvet. There are two more or less conspicuous narrow black lines radiating from the eye, a lower running to the gape and an upper to above the gape, in other respects they accord with the description given by Boulenger.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

DIBRUGARH, ASSAM, *October* 1907.

No. XX.—REMARKS ON THE AGAMOID LIZARD (*CALOTES JERDONII*).

This lizard is a common species in the Khasi Hills about Shillong. It is arboreal in habit as its colouration suggests. Those I encountered were usually among foliage, mostly on low bushes or bracken ; but one fell at my feet from an overhanging bough of a pine some eight feet or so above the ground.

On the 25th of August I witnessed a little love affair, my attention being at first attracted to a ♂ which I discovered subsequently was forcing his attentions on a ♀ which he pursued into some grass. A short interval allowed me to catch the pair " in flagrante delicto". A gentleman told me he had about the same time witnessed a similar scene. The breeding season appears to be very late.

In life these lizards are most beautiful, the prevailing colour being a light verdant green. The two I caught " in copula " were of a dull green, inclining to an olive-green ; but as soon as they were immersed in spirit, it is perhaps remarkable that the green acquired a much brighter hue, similar to that seen in many specimens encountered in a foliaceous environment. They are, like many other species of *Calotes*, able to modify their colour considerably so as to harmonise with their surroundings.

The colour is as follows : Dorsally bright green, rather brighter in the ♂ than in the ♀. A light brown black-edged dorsal band passes forward to the upper temporal crest, and backwards to the base of the tail, where it blends with its opposite fellow. There is a conspicuous black in the fold above the shoulder. The tail, green at the base, acquires a brown hue above and below posteriorly and some darkish ill-defined annuli. The head is green, and several black lines radiate from the eye. The belly is a very light emerald-green, spotted with golden-green. There is a yellow or orange patch on and below the elbow, and another on the knee, running up the anterior aspect of the thigh.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

DIBRUGARH, ASSAM, 25*th October* 1907.

No. XXI.—ON THE NETS USED BY THE FISHERMEN OF NORTH KANARA.

We are indebted to Mr. R. E. Enthoven for the following particulars of the nets used by the Harkantras, a fishing caste in North Kanara, which he has kindly passed on for the information of our members. Following up Mr. Wallinger's paper on Estuary Fishing in the Konkan, the details are interesting as illustrating the methods in vogue on adjoining parts of the West Coast of India.

There is no mention of any Stake Nets equivalent to the " Bhokai " of the Konkan, but the wall nets are numerous.

1. " Torke-Bale ".—This is a large net, 50 feet long and 15 feet in depth, with a 12-inch mesh, and is used out at sea to catch large fish, such as Turmai, Karli, Sora and Visan. It is fitted with stone weights and wooden floats, and is fixed in position by means of heavy stones as anchors, and is often left set for several days at a time. It is taken up into the fishing boats and not dragged ashore.

2. "Kantle-Bale".—A very similar net to the foregoing, but with a 3-inch mesh, and used for smaller fish, such as Mádli, Sheda and Ranvansa. It is 40 feet by 16 feet in depth, and is usually set in 7 to 10 feet of water in the same way as the "Torke-Bale".

3. "Bide-Bale".—This net is apparently a modification of the two previous ones, the single net being 20 feet by 10 feet with a 6-inch mesh, but a number of them are joined together, generally 8 or 10, and set out at sea in about 40 feet of water.

4. "Bangdo-Bale".—This net is similar to the "Kantle-Bale," with the exception of the smaller mesh, which is only 2 inches, and is reserved specially for shoals of "Bangde" whenever they appear. Several of the nets are strung together, and an enclosure formed, into which the fish are then driven.

5. "Yal-Bale".—This is a drag-net that is used near the shore or in the creeks. It is normally 15-feet by 6 feet in depth, with 6-inch mesh, but a number of them, up to 15, are generally joined together. Large fish are caught in this net—it is said up to 10 maunds (820 lbs.)—and ten men or more are employed in working the net.

6. "Rampan-Bale".—A smaller edition of the "Yal-Bale" with a 2-inch mesh that is used for smaller fish.

7. "Yendi".—This is a long draw-net, generally 50 feet by 6 feet, with a 2-inch mesh and poles at either end. It evidently corresponds to the "Para" of the Konkan.

These apparently complete the wall nets, and the small miscellaneous nets are described as follows:—

8. "Dand-Jal".—This is the Kanara equivalent of the Konkan "Gholwa," but is said to be 15 feet, by 12 feet, with a ½-inch mesh, and fitted with poles at either end, so as to be worked by two men as a draw-net

9. "Kuli-Jal".—These are small bag nets made of cotton thread and described as similar in shape to a billiard table pocket, but about twice as large. Some 50 or 60 are fixed along a rope, which is securely anchored with large stones at each end in 6 to 10 feet of water. The nets are threaded together with short lengths of split bamboo and left set for several days. They are mostly employed in the creeks during the rainy season.

10. "Kuind-Bale".—This is described as a small hand-net, used singly. The description proceeds: "It has two thick ropes running crosswise just in the middle, so that when being lifted up from the waters it closes slowly upon the fish coming within its range." I must confess I do not follow how it is worked with these ropes.

11. "Kai-Bale" or "Bis-Bale" (Kan.), "Hát-Jal" or "Shondi-Jal" (Mar.). This is the "Pag" of the Konkan as described by Mr. Wallinger.

12. "Jálige." This net is used exclusively to catch "Tárle" fish.

I regret that I am unable to give the scientific names of the various fishes mentioned, but perhaps some of our members in the North Kanara District may be able to supply the information or, failing that, might send us small specimens of them in spirit to enable them to be identified. They might possibly be traceable in Day's "Fishes of Malabar," but I have not access to a copy of the book.

E. COMBER.

KARACHI, 11*th August* 1907.

No. XXII.—KEENNESS OF SIGHT IN BIRDS AND ANIMALS.

It is extraordinary what different opinions one hears expressed as to the keenness of eye-sight in animals and how few people appear to agree as to any particular animal having long or short sight. The Felines, for instance, are generally credited with *long* sight, but on page 1016 of Vol. XVII of our Journal, Major Burton doubts that the tiger has *keen* sight because he has known of instances where they have looked at him "with unseeing eyes." I can also tell of a similar case, when a tigress took up her position directly behind my "machan" and where I had least expected her, there being a village not far off and open fields within 15 yards of where I sat, and I had not even taken the trouble to close up the back of the "machan" to any extent. Thanks to some spur fowl, which gave her away, I noticed her, by twisting round my neck, before she saw me. That she did see me I could not doubt, as she looked hard and long straight at me and then quietly sat down. It was then almost dark, and I longed for her to hurry up and approach the kill, which lay in front of her, but she had no intention of obliging. She would turn her head away and look about, but very now and again bring it back with a jerk, to have another look at me and seemingly could not quite make me out, but had a faint suspicion that all was not right. I was dressed in green "shikar-cloth" with a hat to match and must have blended well with the surroundings. She sat there quite 10 minutes or more, when she suddenly got up and walked off very fast into a bit of dense jungle, and that was the last I saw of her, and a nasty stiff neck was the only result of my patience and not daring to move for fear of frightening her. To return to the subject, however, is a case like this, sufficient to condemn the eye-sight? An animal may be as keen and long-sighted as an eagle, yet not detect an absolutely stationary object, particularly if its colouring harmonizes with its environments. How many of us have stood staring at a cheetal stag, a serow, or even a huge thing like a bison, at close quarters, when the breaking of a twig or some other sound has warned you that your quarry is near, for perhaps a minute or more, with "unseeing eyes," till the flap of an ear or even the droop of eyelid has told you that the object you have been looking hard at is the animal you are after? "How on earth did I not see that at once?" you ask yourself, in amazement, as the whole form and every outline is now clearly visible. The fact remains that you frequently do not, when the animal stands absolutely motionless and the keenest eyed shikari is often mistaken. If, however, comparing the human sight with that of an animal will not prove my argument, let me refer my readers to the keen, sharp eyes of the *Falconidæ*, about which there can be absolutely no doubt; yet exactly the same argument holds good in their case, *viz.*, that a hawk or falcon will almost invariably overlook a stationary bird.

I have, myself, time and again proved this to be the case, when trying to catch falcons. Not long ago, I had my nets out with a white pigeon between them, waiting for a Hodgson's Hawk-eagle, which soared over my bungalow every afternoon. He arrived, my pigeon saw it and sat absolutely still, and though the eagle was not 50 yards above it, appeared not to see it and continued ringing, higher and higher till I pulled the string, the pigeon fluttered and the eagle was in the net before 5 seconds had gone. This was in an open spot with dense jungle all round and a white pigeon on the bright green grass, just about as conspicuous an object as one could well find anywhere, yet when still, it was passed over by the eagle. This same species I have caught with a rat, across a deep valley, at least 300 yards across, so there can be no question of its being long sighted.

In the same way I have waited for long minutes for a peregrine falcon which would not look at a tame pigeon set behind a noose, right in front of it, till the pigeon has moved or fluttered, and yet a peregrine will drop from the heavens or appear from "nowhere" when another falcon, a decoy, is thrown out in an open plain with a few feathers mixed with horse-hair nooses tied to its leg, taking the feathers for a bird, in the decoy's claws.

I could quote similar instances, *ad lib.* almost, to show that at least the "hunting" birds do not notice stationary objects, and perhaps the same applies in the mammals. It is not that they cannot or do not see them, for they must. An object that is visible to a man at a hundred yards must be so to an eagle at 50, and yet is unmolested till it moves. On the other hand a "Lammergeyer" will see a bone in a dark ravine as he glides past, some 300 feet above it, and the same applies to kites, crows, vultures and such like, but these are not "hunting" birds.

Are their eyes keener than the hawk-eagles, hawks or falcons? I should doubt it.

The birds which are in the habit of killing their own prey never seem to notice or even look at a motionless object, and when they do see it, do not appear to realize that it is worthy of note and so pass on. It is not because they disdain to touch what is not of their own killing, as many books would have us believe; for they will. Take a dead quail or any other bird, ruffle its feathers a little and throw it out in front of a sparrow-hawk sitting on a tree and see how often he will refuse it? Or tie a string to its leg and pull it past the tree the hawk is sitting on and it is ten to one he will come for it. Seeing it move he possibly thinks it is alive, but he surely knows it is not the moment he catches it, but once caught he will not drop it because it is dead.

A man huddled up in a "machan" making himself as inconspicuous as he possibly can with leaves and branches to aid him, might well be passed over. I have frequently deceived crows on a kill by keeping still, and nobody can accuse them of not having keen eyes, so why should those of a tiger or panther be condemned for not seeing you under similar circumstances. They, I dare say, see you alright, if they look up at all, but do not connect the conglomeration of leaves, sticks and the bulky form behind, lying or sitting in a confused heap, with a man or danger.

C. H. DONALD, F.Z.S.

BHADARWA, KASHMIR STATE, *31st July* 1907.

No. XXIII.—CANNIBALISM OF A CATERPILLAR.

I believe that prior to the discovery by Mr. F. P. Dodd in Queensland, of the carnivorous tendencies of the larva of *Liphyra brassolis* (*vide* "Entomologist" xxxv, 1902, p. 153 and Fauna of British India, Butterflies, Vol. II., p. 453) no case of flesh-eating and much less of cannibalism among Lepidoptera was known. If this is correct, the record of an instance of this nature by a larva of *Papilio aristolochiæ* cannot fail to be of interest.

As I first took the larvæ partly because they were feeding on *Aristolochia elegans* (an exotic in India) instead of on *A. indica*, its normal host plant, but mainly to note the dates and duration of the several instars, I enter here the observations as they are recorded.

Two larvæ, more than half grown, were secured on the 7th August 1907, and another only ⅜″ long on the 10th August. Of the first couple one pupated on the 17th and the other on the 18th. Both pupæ and the larva were kept in the same glass-topped box.

On the 25th August on inspecting the box only one pupa and the larva, now nearly full grown, were to be found. At first I suspected ants had got at the box, but none were about, and the second pupa was untouched though the two were close together; moreover, there did not seem any possibility of ants getting into the box which was verified by the fact that later I kept some very small ants in the same box and they were unable to find a way out.

On removing all the *Aristolochia* leaves from the box, no alien insect was found, but I discovered 3 pieces of the chitinous pupal case. My suspicions were consequently diverted to the remaining caterpillar, which I then left with the second pupa in the otherwise empty box, even placing it in contact with the latter. It remained practically motionless for about half an hour, then after investigating the pupa moved away.

I frequently inspected the box and its contents during the rest of the morning, but the caterpillar remained aloof and the pupa was unmolested. At about midday I removed the caterpillar to another box and placed with it the remnants of the destroyed pupa and soon after was it positively eating the remains which it devoured completely. At a little past one o'clock I replaced the same leaves which had been removed from the original box and very soon the caterpillar was feeding off them, so that it cannot be said that the pupa was eaten owing to a lack of proper food. It may be mentioned that a day before the disappearance of the pupa I noticed the caterpillar close alongside it and distinctly heard the rustling sound these pupa sometimes make when wriggling on being molested; at the time, however, I attached no importance to this, and it did not occur to me that the larva would injure it in any way.

The cannibal larva prepared for pupation 3 days later on the 28th and pupated on the night of 29th—30th, and a normal imago issued on the 13th September.

There can be no doubt that the caterpillar actually devoured the pupa.

CECIL E. C. FISCHER.

DEHRA DUN, *17th September* 1907.

No. XXIV.—NOTE IN REGARD TO THE HABITS OF THE PRAYING MANTIS.

Referring to Mr. Dunbar Brander's note, on his naving observed a Mantis shed its skin and then proceed to eat it. The mere shedding of its skin by this insect, an othopterous one, is an ordinary occurrence in the process of growth, and when observed by me the chitin split down the back and the insect proceeded to crawl out of the opening, growing appreciably during the operation. I have never, however, yet seen this insect eat its skin, possibly the one observed by Mr. Dunbar Brander was very hungry or more likely had an abhorrence of waste and considered it a sound idea to stow away its cast off coat with the object of patching up the new one as soon as ever it became uncomfortably tight?

L. K. MARTIN.

CHANDA, C. P., *15th August* 1907.

No. XXV.—SEXUAL ATTRACTION IN LEPIDOPTERA.

About the end of August I had a number of pupæ of *Clania crameri*, a psycid moth very common here, in their thorn-covered cases. The first moth to emerge was a female, a grub-like creature destitute of wings, legs, and antennæ, which under normal conditions never leaves its larval case. As I had known of males being captured at rest on larval cases containing females, I put the moth in a small tin box in my pocket as I went out in the evening, with the intention of trying "sembling" by putting it in a muslin bag in a place likely to be haunted by males. Just about dusk as I was picking up some pyralid larval from a low creeping plant my attention was attracted by the buzz of an insect close to my waist. I thought at first it was a beetle, but when a minute later it returned I saw that I was mistaken, and whipped it up with my net as it hovered over my pocket. It was a male *C. crameri*. The sexual sense must have been remarkably keen to enable it to detect the presence of a female shut up in a box tin in my pocket. I put out this female and one or two others, which emerged later on, in muslin bags tied in the branches of bushes in my garden, and they proved so attractive that I found quite a dozen males at one time or another at rest on the bags.

W. HOWARD CAMPBELL.

GOOTY, *28th October* 1907.

No. XXVI.—SWEEPING FOR MOTHS.

It may interest those who are working at the Lepidoptera heterocera to know that I found sweeping with a butterfly net an excellent way of capturing varied species of *Syntomidæ.* When on the plains last hot weather I took quite a number of specimens of *S. aperiens* and *S. gelatina* by sweeping my net lightly over the leaves of bushes and grasses by the roadside, and here in Gooty I have recently taken a fine lot of *S. ochreipuncta*, of which I had previously seen only two specimens in this locality, by the same method.

W. HOWARD CAMPBELL.

GOOTY, 28*th October* 1907.

No. XXVII.—FLEAS AND PLAGUE.

Now that most people are agreed that it is fairly well established that fleas have a good deal to do with the spread of plague, it might be worth considering whether fleas do not prefer certain conditions to others and whether those places in India in which plague has never got a real hold, do not possess in common certain properties, either in the soil on which they are built or in the nature of their climate, which are antagonistic to the propagation of the flea.

To take an instance, Shikarpur is a very congested town of 50,000 inhabitants in the Sukkur District of the province of Sind. Its state is far from sanitary, and yet, although plague has attacked several adjacent places, I believe that no indigenous case of plague has occurred here: there have been several imported cases. The Civil Surgeon of Shikarpur, who has been studying the question, informs me that, though rats are plentiful in the town, very few fleas are to be found on the specimens captured, and that the town is singularly free from fleas. Anyone would imagine that Shikarpur would be infested with fleas, the houses are closely-packed, composed of small dark rooms seldom aired or cleaned. Again, the rats are said to be different to the rat of Bombay.

Some attempt is, I believe, being made to collect specimens of rats throughout India for purposes of investigation whether any particular specimen appears to be more prone than others to infection by plague.

It would be interesting if the investigation could be extended to include inquiries as to the prevalence, or the contrary, of fleas in the districts affected by plague and in those that have suffered least. Such an investigation might result in valuable information.

Possibly a geological and meteorological investigation of places where plague has and has not been prevalent, would also be of much assistance in solving the problems connected with plague.

E. L. SALE.

SUKKUR, SIND, 29*th October* 1907.

[In reference to the above, Capt. W. Glen Liston, I.M.S., Acting Director, Bombay Bacteriological Laboratory, to whom the note was referred, writes as follows : " I have read with much interest Mr. Sale's letter. I believe there are many interesting things connected with plague still to be found out, particularly the reasons why certain places escape the disease while others suffer. I can give two interesting instances. In Simla (which has so far escaped the disease) the largest percentage of fleas found on rats (over 90 per cent. I believe) belong to the species *Ceratophyllus fasciatus* and *not* to *Pulex cheopis* which I may call the 'Plague-rat flea'. Again, Capt. Gloster has visited the Kangra District in the Punjab where plague has never established itself. In certain plague free villages he caught a number of rats which all conformed to the type of *Mus rattus* which we recognize as variety *alexandrinus.* Very few specimens of this type are found in Bombay and in certain plague-infected Punjab villages the rats of which were examined. I cannot, however, say that the reason why the Kangra villages escaped plague, is because of the presence of this type of *rattus*, since there are other possible explanations." This Society will be very glad to receive specimens of rats from all parts of India to assist in the matter of identification.—Eds.]

No. XXVIII.—A NOTE ON *HURA CREPITANS*, LINN., FOUND IN KHANDALA, WESTERN GHAUTS.

Hura crepitans belongs to the N. O. Euphorbiaceæ. It is indigenous in Tropical America, and known as Javilla in Panama, and Acupo and Habillo in New Granada. In popular English it is called sand-box from the fact of its fruit, which is a many-celled woody capsule, being used as a sand-box in the colonies of Tropical America. For this purpose the fruit is first boiled in oil to prevent dehiscence, and then emptied of its seed.

The tree is from thirty to forty feet high, numerously branched. In its native country it is often planted for the sake of its shade for which it is well adapted, having a great abundance of glossy peepul-like or poplar-like leaves. The tree is of rapid growth, says Surgeon-General E. Balfour. The trunk is strongly armed ; the wood is light. " From the quickness of its vegetation, its parts are of so loose a texture that a loud clap of thunder, or a sudden gust of wind, frequently causes the largest boughs to snap asunder. The wood is only fit for joists and spars." (Loudon's Encyclopædia of Plants.)

The inflorescence is very characteristic. In Lindley and Moore's Treasury of Botany, (p. 602, Pt. II, 1870, London) A. A. Balfour says thus :—" The reddish inconspicuous flowers are sterile and fertile on different plants." In the specimen from Khandala which I exhibit, the female flowers and the male catkins are on one and the same plant.

The male flowers are in stalked " catkin-like heads, each flower with a cup-shaped calyx and a central column around which are one or many rows of scale-like bodies, each supporting on its concave face a stamen." (A. A. B.)

The female flowers are solitary and stalked in the axils of the leaves, with a like calyx and a rounded ovary terminated by a singularly trumpet-shaped style. The terminal portion of the style, *i. e.*, the stigma, is cup-like, having a reflexed many-toothed border.

The ovary consists of many carpels, 12-20. In the N. O. Euphorbiaceæ, the ovary is typically trilocular. But in the Genus *Hura* it is multilocular. Prof. Vines says that in *Hura crepitans* the carpels are from 5-20. (Text-Book of Botany, p. 621, 1895, London.)

The fruit is a capsule, rounded, consisting of curiously-shaped hard-shelled carpels and about the size of an orange. They have as many deep furrows as there are cells. When the fruit is mature and dry and "exposed to the action of a dry atmosphere, it bursts with great force accompanied by a loud sharp crack, like the report of a pistol for which reason it is often called the Monkey's Dinner-Bell." (A. A B.). In the 3rd edition of Lyon's Medical Jurisprudence there is the following remark on the Sand-box tree :—" Chevers on the authority of Dr. H. Cleghorn remarks that this tree introduced from the West Indies is not uncommon at the Presidency Towns." Mr. Millard, our Honorary Secretary informs me that he believes that the Khandala tree was introduced there by the Hon'ble Mr. Rustomji Jamsetji Jijibhoy in 1864.

The seeds are lenticular, varying in diameter from 17 mm. to 20 mm. according to Kerner von Marilaun.

The inflorescence appeared at Khandala in May last and the fruit was ready in October last. Both Johnson and Paxton say that the plant was introduced into England in 1733. As a stove-evergreen tree it bears whitish-yellow flowers, say Johnson and Paxton. But Loudon says that the male and female flowers are violet. The Khandala flowers were beautiful lake-coloured.

Loudon observes that the species are propagated by large ripened cuttings planted in heat and covered in a hand-glass. His description of the fruit is characteristic. It runs thus:—" The fruit is of a very elegant form resembling a depressed sphere with many rounded ribs, arranged with the utmost symmetry."

The seeds are violently purgative. The sap of the leaves and bark, says Loudon, is corrosive and the seeds " *when roasted* purge both upwards and downwards." According to Lunan dry seeds lose their drastic property ; the seeds are drastic and emetic only in the green state. Boussingault says that when he and M. Rivers analysed some milk of the *Hura* sent to them from Guaduas by Dr. Roulin, they were attacked with erysipelas. " The courier who brought it was seriously injured, and the inhabitants of the houses where he had lodged on the road experienced the same effects." (Le M. and D.) What is called " milk" is not white, but thick sap resembling the syrup of cane sugar. When I took the plant from Khandala to Lanoli, the few drops that trickled down my fingers from cut ends of the sprigs, irritated my hands. There was an itching sensation, and nothing more.

K. R. KIRTIKAR, F.L.S.,
LT.-COL., I.M.S., (Ret.)

ANDHERI, SALSETTE, *December* 1907.

PROCEEDINGS

OF THE MEETING HELD ON 12TH DECEMBER 1907.

A meeting of the members of the Bombay Natural History Society took place at the Society's Rooms on 12th December 1907, the Revd. F. Dreckmann, S.J., presiding.

The election of the following 40 new members since the last meeting was duly announced:—

Mr. J. H. Garrett, I.C.S. (Ratnagiri); Mr. T. S. Gregson, (Bombay); Mr. D. Reynolds, R.F.A. (Neemuch, C. I.); Mr. E. A. Boxall (Chiengmai *via* Moulmein and Raheng); Mr. N. E. Reilly (Panjgur, Mekran Coast); Mr. Fred. E. Vernede (Travancore); Mr. C. D. Baker (Bombay); Mr. L. Withinshaw (Vellore, Madras Presidency); Mr. F. W. A. Wells (Jhansi); Mr. C. D'Souza, (Toungoo, Burma); Mr. F. W. Hunt (Somaliland); Mr. J. G. F. Marshall, B.F.S. (Tovoy, Burma); Mr. H. M. Dwane (Dharwar); Mr. J. H. Stirling (Jodhpur); Mr. C. M. McOrie, I. F. S. (Saugor, C. P.); Dr. A. Powell (Bombay); Capt. C. R. Lloyd (Bombay); The Hon'ble Gerald Legge (Johore, Straits Settlements); Mr. E. S. Hearn (Bombay); Mr. W. H. Luck (Rajkote); H. H. Fatesingrao, Raja of Akalkote (Kirkee); Mr. C. V. Vernon, I.C.S. (Hyderabad, Sind); Mr. P. B. Haigh, I.C.S. (Bombay); Mr. C. H. Stockley (Somaliland); H. E. Sir George Sydenham Clarke, G.C.I.E. (Bombay); H. E. Commodore Sir George Warrender (Bombay); Mr. J. W. Smith (Sialkote); Mr. C. W. Craig (Bhatinda, Punjab); Mr. H. W. E. Forsyth, R. E. (Bareilly); Mr. W. S. Rogers (Bombay); The Mess Secretary, 59th Scinde Rifles (Peshawar); Capt. J. W. Garwood (Bombay); Mr. E. H. Lovell, R. A. (Attock); Mr. M. C. Gribbon (Kohat); Mr. E. J. Jephson (Mingin, U. Chindwin, Burma); Mr. C. S. Barton (Mingin, U. Chindwin, Burma); Mr. C. H. Hobart (Kindat, U. Chindwin, Burma); Mr. R. W. D. Wallis (Mingin, U. Chindwin, Burma) and The Secretary, Byculla Club (Bombay).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged receipt of the following:—

Contribution.	Description.	Locality.	Contributor.
Skin of a King Cobra	*Naia bungarus* ...	Palanpur ...	Col. G. Hyde Cates.
2 Rock Lizards ...	*Agama tuberculata*...	Kasauli ...	Col. F. W. Thompson.
A number of Butterflies.	......	Darjeeling ...	Rev. F. Moller.
1 Snake	*Tropidonotus plumbicolor.*	Dharwar ...	Mr. C. Hudson, I.C.S.
1 do.	*Coluber helena* ...	Kilkotagiri ...	Mr. A. M. Kinloch.
Shells of the Himalayan Snail.	*Helicarion flemingi*...	Nagar Kulu ...	Genl. W. Osborn.
1 Snake	*Tropidonotus piscator*	Attock ...	Mr. A. McDonough.
2 Seesee Partridges (alive).	*Amoperdix bonhami.*	Karachi ...	Mr. W. Clements.

Contribution.	Description.	Locality	Contributor
Some fishes	......	Persian Gulf ...	Mr. F. W. Townsend.
Single shed horn of Sambhar.	*Cervus unicolor* .	Nimar, C. P. ...	Mr. S. D. Smith.
1 Bat	*Scotophilus kuhlu* ...	Karachi ...	Mr E. Comber.
17 Sea Snakes ...	... ..	Karwar ...	Mr. C. C. Boyd, I.C.S.
1 Monkey mouthed Shark.	*Stegostoma tigrinum.*	Do.	Do.
1 Eel	*Muræna sp*	Do.	Do.
1 Snake	*Pseudoxenodon macrops.*	......	Major F. Wall I.M.S.
2 Snakes	*Columber porphyraceus.*	......	Do.
2 do.	*Psamodynastes pulverulentus.*	......	Do.
5 do.	*Lachesis monticola* ...	......	Do.
1 do.	*Lachesis jerdonii* ...	......	Do.
3 do.	*Poliodontophis collaris.*	......	Do.
1 do.	*Zaocys nigromarginatus.*	......	Do.
3 do.	*Callophis macclellandii.*	......	Do.
1 do.	*Tropidonotus khasiensis.*	......	Do.
1 do.	*Tropidonotus parallelus.*	......	Do.
1 do.	*Tropidonotus himalayanus.*	......	Do.
1 do.	*Amblycephalus monticola.*	......	Do.
2 do.	*Blythia reticulata* ...	......	Do.
2 do.	*Rhabdops bicolor* . .	......	Do.
5 do.	*Trachischium monticola.*	......	Do.
2 do.	*Dinodon septentrionalis.*	......	Do.
1 do.	*Ablabes frenatus* ...	......	Do.
3 Lizards	*Ophisaurus gracilis.*	......	Do.
4 do.	*Ptyctolæmus gularis.*	......	Do.
2 do.	*Calotes jerdoni* ...	......	Do.
2 do.	*Calotes versicolor* ...	......	Do.
2 Snakes	*Dipsas trigonata* ...	Matheran	The Supdt. of Matheran.
1 Indian Monitor ...	*Varanus bengalensis juv.*	Khandwa	Lt.-Col. H. E. Banatvala, I.M.S.
2 Snakes (alive) ...	*Tropidonotus piscator* *Lachesis anamallensis*	Kilkotagiri	Mr. A. M. Kinloch.
1 Krait	*Bungarus candidus*...	Matheran	The Supdt. of Matheran.
Some pressed Ferns...	......	Darjeeling	Col. W. B. Ferris.
5 Snakes	... .	Dthala, Aden	Capt. H. R. Watson.
2 Sharks (juv) ...	......	Aden	Mr. H. Seton-Karr.
2 Snakes (alive) ...	*Dipsas trigonata* *Simotes arnensis.*	Banda, U. P.	Mr. St. G. deCarteret.
1 Dhaman juv. (alive)	*Zamenis mucosus* ...	Bombay	Mr. N. St. Paul.
3 Rats (alive) ...	......	Dharwar	Mr. C. Hudson, I.C.S.

Contribution.	Description.	Locality.	Contributor.
7 Rats (alive) ...	......	Pithora	Bombay Government.
8 do.	......	Bhusawal	Do.
2 do.	......	Jalgaon	Do.
7 do.	......	Amalner	Do.
4 do.	......	Yeola	Do.
5 do.	......	Chalisgaon	Do.
10 do.	......	Pachora	Do.
11 do.	......	Shikarpur	Do.
3 do.	......	Erandol	Do.
2 do.	......	Jamner	Do.
do.	......	Dharwar	Mr. O. Hudson, I.C.S.
1 Red-headed Bunting	*Emberiza luteola* ...	Jhansi	Lt. C. Thornhill.
A number of pressed flowers and plants.	......	Chamba State	Capt. R. St. J. Gillespie, R. E.
Some Scorpions (alive).	......	Ratnagiri	Mr. F. W. Townsend.
1 Nodule	......	Manora, Karachi	Do.
1 Viper	*Echis carinata* ...	Hyderabad, Sind	Capt. H. Harding, R.A.M.C.
1 Snake	*Oligodon dorsalis* ...	Mansi, U. Burma	Mr. D. H. M. Boyle.
2 Rats (alive) ...	......	Pithora	Bombay Government
*2 Leopard Cats (alive)	*Felis bengalensis* ...	Karwar	Mr. W. F. Jardine.
1 Snake	*Psammodynastes pulverulentus*	Mansi, U. Burma	Mr. D. H. Boyle.
1 Rat	......	Dindori	Bombay Government.
4 Rats	......	Ratnagiri	Capt. R. W. Anthony, R.I.M.S.
9 do.	......	Panch Mahals	Bombay Government.
1 Case with mounted specimens of Leaf Butterflies showing mimicry.	*Kallima inachus* and *Kallima horsfieldi.*	......	Mr. W. S. Millard.
2 Snakes	*Polyodontophis saggitarius.*	Dinajpur, E. B. S. Ry.	Col. C. T. Peters, I.M.S. (Ret.)

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* Forwarded to the Victoria Gardens, Bombay.

Minor Contributions from Miss L. Moxon, Mr. McWaters, Mr. A. Simcox, Mr. Tottenham, Mr. Collins, Mr. D. Witt, Mr. J. M. Kerr, Mr. W. S. S. Rogers, Lt.-Genl. W. Osborn, Mrs. J. Adam, and Mr. D. H. M. Boyle.

CONTRIBUTIONS TO THE LIBRARY.

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- A Guide to the Fossil Reptiles, Amphibians and Fishes in the Department of Geology and Palæontology in the British Museum (Nat. Hist.)
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Herpetology of Japan and Adjacent Territory, by L. Stejneger. From the Smithsonian Institution.

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Flora Simlensis, by Col. Sir Henry Collett. Presented by Mr. C. W. Craig.

Curative value of a local infection with live pyogenic germ in Bubonic Plague, by Dr. R. Row, M. D. From the Author.

Effects of "Salted" Plague Toxin as a curative vaccine in man, by Dr. R. Row, M. D. From the Author.

Bacillus Pestis in Symbiosis with Staphylococcus Pyogenes, by Dr. R. Row, M.D. From the Author.

Some properties of Plague Toxin with special reference to the characters of a "Salted Plague Vaccine," by Dr. R. Row, M. D. From the Author.

PAPERS READ.

The following papers were then read :—

1. A Note on *Hura crepitans* (Sand box), found at Khandalla with specimens of flowers, fruit and seed, by Lt.-Col. K. R. Kirtikar, I. M. S. (Retd.), F. L. S.
2. On some Bombay "Hydras," by A. Powell, M. D.
3. Fleas and Plague, by E. L. Sale, I. C. S., with a note by Capt. W. Glen Liston, I. M. S.
4. A Gaur attacking and killing a man without provocation, by Lt.-Col. H. V. Biggs, R. E.

The meeting then terminated with a vote of thanks to the authors of the different papers, which will appear in the Society's Journal.

REPORT OF THE BALUCHISTAN NATURAL HISTORY SOCIETY.

Meetings of the Members were held in the Quetta Museum on the 25th July and 29th August 1907 and lists of the donations to the Museum and Library were recorded. At the meeting held on the 1st of October correspondence with the Superintendent, Indian Museum (Natural History Section), Calcutta, was read, regarding a consignment of rats and snakes forwarded to him from the Quetta Museum on the understanding that one of each should be returned properly classified, and it was resolved that the next consignment be forwarded to the Bombay Natural History Society on the same understanding.

The Honorary Secretary (Mr. J. W. N. Cumming) placed before the meeting a list prepared by Rai Sahib Diwan Jamiat Rai of all the reports, &c., which have been published on the subject of the Geology of Baluchistan and reported that the Rai Sahib was preparing a similar list of the publications issued on the Botany of Baluchistan and that a complete list of notes, &c., on the Zoology of the country would be prepared on receipt of the complete set of the Bombay Natural History Society's Journals. The meeting expressed their thanks to Rai Sahib Diwan Jamiat Rai for the list prepared by him and resolved that the preparation of the other lists be awaited.

The President (Sir Henry McMahon) then suggested that members should in future bring to these meetings brief notes of any observations they may have made in the matter of Zoology and Botany, &c. He mentioned the following rare snakes as having been found in Baluchistan :—

(1) *Vipera lebetina* or the Euphratic Viper, common in Ziarat.

(2) *Zamenis bavergieri*, also common in Ziarat.

(3) *Zamenis arenarius.*

Sir Henry further said that some specimens of *Lycodon striatus*, recently found near the Staff College, from their likeness to Kraits (*Bungarus cœruleus*), had caused a scare that Kraits were common there. No Kraits however have ever yet been found in Baluchistan. He also mentioned that Major Goodwin had seen an undoubted cobra on Zarghun and had found Bee-Eaters breeding there ; also that he himself had seen a flock of green parrots flying over Ziarat on 1st September 1907, while Major A. McConaghey had noticed them in his garden at Quetta.

The Revd. Mr. Lawrence then remarked that he had come across a number of *Erythrospiza obsoleta*, a species of Desert Rose Finch about Quetta, and Mr. Cumming corroborated his statement, adding that he had secured a nest of their eggs, and that the bird appears to be what Capt. Marshall and Major Betham described as Hume's Hawfinch in their notes contributed to the Bombay Natural History Society's Journal on the "Birds of Quetta."

Mr. A. Anderson then mentioned that he had found the Golden Oriole (*O. kundoo*) breeding in Quetta. The Revd. Duncan Dixey said that he had seen several water snakes in the pools between Kundalani and Pir Chowki in the Bolan, and would endeavour to capture some the next time he was there.

Sir Henry McMahon and Col. Peirse stated that they had personally come across several Crocodiles in the pools down the Bolan and elsewhere in Baluchistan, and that these animals had been known to die off in large numbers during severe winters. No instance has ever been reported of these animals attacking either men or animals in Baluchistan.

Mr. W. R. S. Porter mentioned that the Pied King-fisher had been seen by him in the Residency Garden at Quetta.

In conclusion the Revd. Duncan Dixey informed the meeting that the Kasauli Institute was clamouring for ticks from all parts of the country, and suggested that members should preserve all they come across.

The meeting then adjourned, the President promising to try, if he found time, to prepare a note to read at the next meeting of the Society, showing the position which Baluchistan occupies in regard to the geographical distribution of the fauna of the world.

At the meeting of the Society held on the 31st October 1907, the Honorary Secretary reported the action taken on last month's proceedings, and placed before the meeting the following specimens which had been returned duly identified by the Indian Museum, Calcutta :—

(1) *Nesocia hardwickei* (Gray), the Short-tailed Mole Rat.
(2) *Cricetus phæus* (Blanford), the Little Grey Hamster.
(3) *Mus bactrianus* (Blyth), the Persian House Mouse.
(4) *Alactaga indica* (Gray), the Afghan Jerboa.
(5) *Gerbillus meridians* (Pallas), the Field Rat.

The Honorary Secretary was then called upon by the President to read the attached note which he had drawn up on the existence in Quetta of *Erythrospiza obsoleta* (Licht) named also *Rhodospiza obsoleta* (Sharpe) which had been briefly referred to at the last meeting. On the motion of the President a vote of thanks to the Honorary Secretary was duly passed, and it was resolved to style the *Erythrospiza* (*Rhodospiza*) *obsoleta* the "Quetta Rose-Finch" in view of its being so common in Quetta.

Sir Henry McMahon then placed before the meeting two pairs of Ibex horns presented by Mr. Beaty to the Museum, which he had procured from the Chahiltan range of mountains, and pointed out the wide curve of these horns and the way the horns closed in towards each other at the top, thereby making them differ widely from the usual type of Markhor horns. He said that there had long been an idea that there existed on the hills round Quetta a cross between the Markhor and Ibex. The horns now exhibited did not show any characteristics of Ibex horns, notwithstanding their shape and want of massiveness. Mr. Beaty pointed out their resemblance to the horns of the big-horned black domestic goats common in this country. The animals shot on Chahiltan, from which these two pairs of horns were obtained, were, he said, of the colour and shape of ordinary Markhor. Sir Henry McMahon expressed the opinion that they were probably the result of some past interbreeding between a domestic goat and a Markhor.

Mr. Beaty exhibited a photograph in which a larger pair of horns of the same type, shot on Zarghun, was shown, together with some other Markhor horns, 36 and 38 inches in length. The President pointed out how these other horns also differed from the straight Markhor horns, known as the Suleiman and Cabul variety. He added that he had seen in Baluchistan Markhor horns with even greater curves, somewhat like the Astor variety. He expressed a wish that members of the Society would kindly photograph any Markhor horns they possessed and give them to the Society. It would then be possible to compare them and ascertain the different kinds of Markhor horns to be found in various parts of Baluchistan.

The Honorary Secretary then read the following note :—

ERYTHROSPIZA OBSOLETA (Licht) (*Rhodospiza obsoleta*, Sharpe).

At our last meeting the Revd. F. Lawrence remarked that he had come across a number of *Erythrospiza obsoleta* about Quetta, and I corroborated the statement, adding that I had secured the eggs of the bird. I also remarked that this bird appears to be what Capt. Marshall and Major Betham described as "Hume's Hawfinch" in the notes contributed by them to the Bombay Natural History Society's Journal on the "Birds of Quetta."

Capt. Marshall in his note, dated May 1902, under "Hume's Hawfinch," wrote: "this I think must be the Hawfinch that frequents these parts. It is more or less resident, but is commoner a good deal in summer than winter. I believe it breeds here, as I have seen young birds that had been taken from the nest. It has a very pleasant song."

Major Betham also under the same name, in his note, dated 3rd August 1905 wrote as follows:—

"I have found this bird very common since I have been here (Quetta), but I cannot say where it winters. The first nest I found was on the 24th April 1905: it was placed in the stoutish fork of a small tree against a small stone which had somehow got wedged in and was about 10 feet from the ground. The exterior of the nest consisted of bents, grass, small twigs and sticks rather flimsy, the interior being lined with cotton, wool, hair, &c., welded together almost to the consistency of felt, forming a compact deepish cup. It contained 5 fresh eggs of a very light cambridge-blue, thinly speckled or spotted with blackish and dark-brown spots. When fresh the yolk can be seen distinctly through the shell, which gives the eggs an opalescent tinge. When blown the blue is deeper. After this I found several more nests similarly situated, usually in roadside trees, where they are easily seen, no attempt being made at concealment. The nests are rarely placed beyond hand reach. Five eggs seem to be the complement, though on one occasion I obtained six eggs from one nest. The bird being so common here it seems curious that it has never been found nesting before or rather reported."

Writing again on 6th October 1906 Major Betham stated that he had since found several more nests of the bird in vineyards.

Considering that Captain Marshall had felt a doubt in connecting "Hume's Hawfinch" with the finch which he stated was so common about Quetta, it is a pity he did not give some description of the Quetta bird. As however neither the Revd. F. Lawrence nor I have come across "Hume's Hawfinch" in Quetta, and as Capt. Marshall does not refer in his notes to *Erythrospiza obsoleta* which is the commonest finch about Quetta, we both have come to the conclusion that *Erythrospiza obsoleta* is the bird that Capt. Marshall mistook for "Hume's Hawfinch," and I presume that Major Betham came to the same conclusion. I now place before the meeting a specimen of this common finch of Quetta kindly presented to the Museum by Miss MacBean, and which doubtless most of the old residents of Quetta will recognise. I also place before the meeting a chromo-litho plate of *Erythrospiza obsoleta*, published at page 252*a*, of Eastern Persia, 1870-72, Volume II, Zoology, etc., by W. T. Blanford, which corresponds with the bird before the meeting. I also place before the meeting 4 eggs which were taken from a nest near my bungalow, and quote the following note I made of it at the time:—

"24th April 1907. Nest with 4 fresh eggs (white with brown or chocolate dots) on a willow tree on the roadside near my bungalow, about 10 feet from the ground. Could be seen distinctly from below. When blown the eggs look a pale blue. This tallies with Major Betham's find as described by him under Hume's Hawfinch."

There is thus no doubt that the common finch of Quetta is the *Erythrospiza obsoleta*, and for the reasons given above, is the bird which Capt. Marshall thought was "Hume's Hawfinch."

A brief description of this bird will be found at page 223 of Vol. II of the "Fauna of British India—Birds" under the name of *Rhodospiza obsoleta*. It will also be found referred to under the latter name at page 80 of Vol. V, Part 3, of the "Transactions of the Linnean Society of London"—The Zoology of the Afghan Delimitation Commission.

Unfortunately for the residents of Quetta the scientific name of *Erythrospiza obsoleta* is not easily remembered, and as we, who know the bird, would like to have an English name for it, I think our Society cannot do better than give it one, and as, according to the "Fauna of British India," "the genus *Erythrospiza* contains the palest forms of Rose-finches, birds of the desert," I propose, if the President, Vice-President and members agree, to call it the Quetta Rose-Finch or the Quetta Rose-winged Finch and number it No. 764 (*a*).

J. W. NICOL CUMMING,
Hony. Secy., Bal. Natural History Society.

QUETTA, 31*st October* 1907.

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A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATES AND DIAGRAMS.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

Part VII with Plate VII, with 3 Maps and 2 Diagrams.

(*Continued from page 243 of this Volume.*)

THE SAW-SCALED VIPER OR ECHIS (*Echis carinata*).

Nomenclature.—(*a*) *Scientific.*—The generic name is from the Greek ἔχις an adder, and was introduced by Merrem in 1820. *Carinata* is from the Latin *carina* a keel, and was applied originally by Schneider in 1801 on account of the ridged (keeled) condition of the scales.

(*b*) *English.*—One rarely hears an English name. It is usually spoken of as "the Echis". In many parts, however, the English population have adopted the local native name for it as "phoorsa", "afai", etc. It might be appropriately called the "common saw-scaled viper" in reference to the serrate condition of the keels on the oblique scales referred to hereafter, which when rubbed across one another produce a hissing sound.

(*c*) *Vernacular.*—In Southern India it is called "viriyan pamboo" by the Tamils, but I have also heard it called "soorootai pamboo" which I understand means "coiling snake", and about Trichinopoly "ratta pamboo". Russell * gives the local name for a specimen he acquired from Arni near Vellore as "horatta pam". Perhaps the word is "korattai", the Tamil for "snoring" I am told, but which might also be applied to the hissing sound made by the scales rubbing against one another. In Mysore according to Rice[*] it is called "kallu havu". In the Bombay Presidency it is almost universally known as the "phoorsa". In and about Delhi it is the "afai", a word apparently closely connected with the Arabic names for snake, *viz.* "afa", and "afai", and possibly to the "epheh"[†] of the Hebrew Scriptures. It is the "kuppur" of Sind, and according to Mountford[‡] known as "janndi" in the northern part of that Province. Sir A. H. McMahon tells me it is called "phissi" on the North-West Frontier. Dr. J. Anderson[§] says it is known to the natives of Egypt as "ghariba", but Lyddeker[‖] gives the name in that country as "eja".

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* Ind. Serp., 1796, Plate II., p. 2.

[*] Mysore, Vol. I, p. 188.

[†] The word "*ephah*" I believe occurs only three times in the Hebrew version of the Bible, twice in the book of Isaiah, and once in Job. The passages are translated as follows in the present English Bible:—(1) Isaiah XXX—6. "The burden of the beasts of the south: into the land of trouble, and anguish from whence come the young, and old lion, the viper (epheh) and fiery flying serpent." (2) Isaiah LIX—5. "They hatch cockatrice eggs, and weave the spider's web: he that eateth of their eggs dieth, and that which is crushed breaketh out into a viper" (epheh). (3) Job XX—16. "He shall suck the poison of asps, the viper's (epheh) tongue shall slay him".

The late Canon Tristram identified the "epheh" in the first passage as *Echis arenicola* of Boie which is now considered identical with the *Echis carinata* of Schneider, but the accuracy of his opinion is vitiated by his identification of "epheh" in the other two passages just quoted with *Daboia xanthina* of Gray, a viper now recognised as identical with *Vipera libetina* of Linné. In the two last passages it appears to me that "epheh" is used in a general sense, and is not intended to allude to a distinct species of snake.

On the other hand the first passage which refers to Egypt as "the land of trouble and anguish" seems to refer to some special kind of snake, and one may infer a very well known one characteristic of the country in the same way that the lion was among mammals. Although the Echis occurs in Egypt it is evidently not common there, for Mr. S. S. Flower has favoured me with valuable information on this score. He writes: "Personally I have spent over 9 years in Egypt and the Sudan, but have never seen *E carinatus* alive, nor met any natives who knew of it. It is probably, therefore, of local distribution. In the collection under my charge (Egyptian Government Zoological Gardens) I have had only two specimens of *E. carinatus*, one from Khartoum and the other from west of Masrub. Kordofan, both collected and preserved in spirit by Mr. A. L. Butler. These specimens are now in Vienna, having been sent to Dr. Franz Werner * * Dr. Werner and I constantly exchange herpetological notes, and to the best of my recollection he has never been able to obtain *E. carinatus* himself in the Nile Valley, though he has made three collecting expeditions here on behalf of the Vienna University." Canon Tristram's association of the Echis with the Epheh of the Scriptures is, it must be admitted, open to serious objections.

[‡] Bomb. Nat. Hist. Journal, Vol. XI, p. 74.

[§] Zool. of Egypt, Vol. I.

[‖] Royal Nat. Hist. 1896, Vol. V, p. 288.

Dimensions.—Adults vary from about 18 inches to two feet in length, but larger specimens are sometimes met with. Dr. Imlach* speaking of Sind says the average length of the kuppur is 15 inches. Elliott† in Madras says he has not seen a specimen larger than 16 inches. I am certain I have seen them larger than this in Southern India. Colonel R. Light has written to our Society of examples he has seen in Bhuj (Cutch) which measured 26½, 27½, and 27¾ inches. The late Mr. L. C. H. Young‡ recorded a specimen in this Journal from Andheri near Bombay 2 feet 6 inches long. These are the largest measurements known to me.

Bodily configuration, etc.—Its figure is typically viperine, that is to say, the body compared with that of colubrine snakes is relatively stout for its length, and reduces perceptibly anteriorly and posteriorly. The anterior attenuation makes the neck conspicuous behind the broader head. Dorsally the whole body is rough from the keeled condition of the scales, especially so laterally, where the keels are serrated. The roughness and lustreless character of the scales on the back and flanks are in marked contrast to the beautifully smooth and polished surfaces of the ventral shields, and both doubtless greatly assist colouration in rendering the creature inconspicuous amid its desert environment. The head is subovate or roughly pear-shaped seen from above, and the snout rounded. The muzzle is rounded from side to side unlike many of the pit vipers in which a more or less sharp ridge (*canthus rostralis*) separates the face from the crown. The nostril is placed rather high, and between two shields, and is notably small in comparison with Russell's viper. The eye is large, the iris golden yellow, and the pupil vertical in shape as in all other vipers. The commissure of the mouth is truly viperine, the upper lip presenting a downward rounded prominence situated below the anterior margin of the eye, and corresponding with the position of the fang as placed when the mouth is shut. Our plate shows this very well in figure 6, which should be compared with figure 2. The tail is very evident owing to the great attenuation in calibre which occurs at the anal region, and it tapers very rapidly as in other vipers. It is short, being about one-tenth to one-eleventh the total length of the snake and is about equally short in both sexes.

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* Trans. Medl. and Phys. Soc. of Bombay, 1855 to 1856, p. 80.

† Trans. S. Ind. Br. of Brit. Medl. Assocn., 1893, p. 18.

‡ Vol. XVI. p. 504.

Colour.—As in nearly all the vipers the colouration and markings are very variable. Mr. Boulenger* speaking of another viper (*Vipera ursinii*) says "I must observe that vipers generally vary so much, both individually and according to localities, that little reliance is to be placed for specific distinction on that character."

Usually the ground colour in *Echis carinata* is a light shade of brown, buff, or tawny, and the markings are darker brown, or even blackish. In sandy places, where I have usually met with it, it harmonises wonderfully with its surroundings. Sir A. H. McMahon writes to me: "The Echis adapts itself to the colouring of the locality. I have found them of all shades of colour, from the lightest fawn in sand to almost black in dark rocky country." The body dorsally is more or less mottled or blotched with darker shades sometimes with a decided regularity of pattern as in our plate, more frequently I think irregularly distributed with no special arrangement. These marks may be so obscure as to be hardly noticeable in light specimens, or so heavily abundant that they form the predominating colour when the specimen appears umbery or blackish. A light undulatory line in the flanks is nearly always more or less evident. The head often bears a light patch on the middle of the crown, which is frequently shaped like a dagger, a broad arrow, or the imprint of a bird's foot and there is often a more or less conspicuous streak behind the eye. The belly is light, often whitish, and is more or less sparsely or profusely specked, mottled, or spotted with darker, and often rufous, bistre, or ruddy tints. I have sometimes seen a pinkish band down the middle of the belly.

Identification.—The undivided condition of the subcaudal shields, taken with (2) the small scales on the whole of the top of the head and (3) broad ventrals stretching right across the belly, distinguish this from all other Indian snakes. These characters are shared by the only other member of this genus, *viz. Echis colorata*, a much scarcer and more local species inhabiting Arabia, and Palestine, and also recorded from Socotra. The two are separated chiefly on the nasal shield which in *carinata* touches the rostral, but in *colorata* is separated from it by small scales.

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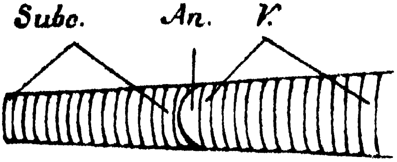
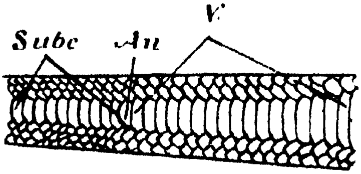
* Proc. Zool. Soc., Lond., 1893, p. 598.



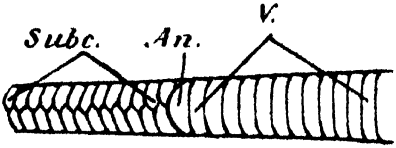
Echis carinata

To show broad ventrals and subcaudals



Eryx conicus

To show narrow ventrals and subcaudals



Dipsadomorphus trigonatus.

To show broad ventrals and divided subcaudals.

V. = *Ventrals.*
An. - *Anal.*
Subc. = *Subcaudals.*

INDIAN SNAKES. (*Wall.*)

Attention to the points above mentioned should admit of no confusion between this and other forms that bear some superficial resemblance to it. Among these may be mentioned *Eryx conicus* and *Dipsadomorphus trigonatus*. I have seen a very old and faded spirit specimen of the former which bore a marked resemblance to *E. carinata*. This species possesses the first two points mentioned above, but the ventrals are peculiarly narrow, several rows of costals (instead of the last only) being visible on either side simultaneously when the specimen is laid on its back. As a matter of fact, there is very little resemblance between the two in colouration in life though I have known the two confused.

As regards *Dipsadomorphus trigonatus* which I have also known confused with the Echis, the resemblance is, I consider, extremely superficial, affecting colour and markings only, the relatively slender and elongate body being very markedly in contrast, and the first two shield characters noted above absent.

Haunts.—It is essentially a desert snake, but occurs plentifully in semi-desert tracts where the soil, though sandy and poor, supports some sparse vegetation, so long as open patches intervene. In Delhi it appeared to be most plentiful on the Ridge where the broken and rocky nature of the ground afforded special facilities for concealment, or retirement in the face of danger, but there are many waste sandy tracts where rocks do not occur where it thrives in great numbers. Blanford[*] obtained 2 or 3 specimens in thin jungle about Ellore, and expressed surprise at finding a desert form like the Echis in wooded country. It is not found in dense jungle, for the reason I suppose that its colouration in such an environment would no longer be protective, added to which it does not appear to need shade, enjoying as it does the fiercest rays of the tropical sun, and at the hottest seasons of the year. It may be seen lying in the sand exposed to the full force of the sun, or may retire beneath stones, or into clefts and crannies of rock so baked with the sun's rays that the hand cannot bear contact with them. Yet even under such conditions it seems to rely solely on the juices of the animals it eats for the moisture necessary to assuage its thirst. It sometimes takes refuge in holes in the ground as I have good reason to know when digging along the burrows leading to the nests of the green bee-eater (*Merops viridis*).

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[*] Journ. Asiat. Soc., Bengal, Vol. xlviii, p. 116.

The sudden and unexpected introduction to this or any other snake under such circumstances detracts much from the pleasures of birds' nesting in this country.

I have occasionally known it come into the house. The late Mr. L. C. H. Young reported one in this Journal* which he found moving round his dinner table, and in Trichinopoly I once found one which had climbed on to the top of my verandah chick.

Mr. Millard writes to me: "It moves very rapidly when it wishes to escape by almost throwing itself from its tail." I have not seen the Echis manifest such activity, but believe that most snakes can do so when making their utmost endeavours to escape. I have certainly seen the Russell's viper do so, and many other snakes. I can find no better way of describing the muscular effort than as a jump. As a rule I have found the Echis maintain its ground, and when closely approached start rubbing its flanks together with great assiduity.

Disposition.—This is the most vicious snake I know. Not only is it extremely apt to bite on the smallest provocation, but strikes out without hesitation, and with great malice. These disagreeable traits in its character and the extreme velocity with which it delivers its stroke combine to make it a most dangerous reptile to meet unawares, or to have any dealings with when fully on the "*qui-vive*" either in effecting capture, or whilst in captivity. The lightning-like rapidity with which it strikes, delivers its bite, and regains its former attitude, must be witnessed to be fully appreciated. The manner in which it exactly resumes the position it occupied before striking, which is characteristic, has left me sometimes wondering whether a stroke had been delivered at all, or my senses had deceived me.

Theobold † calls it "a very active, and irascible snake," and Mr. F. Gleadow ‡ says "it is the smartest striker I know when it means business." Fayrer § says: "The Echis is very fierce and aggressive—it is always on the defensive, ready to attack; it throws itself into a double coil, the folds of which are in perpetual motion, and as they rub against each other they make a loud rustling sound very like hissing* * * . It is very active, and can dart a considerable distance—a foot or more—to strike its prey: it is by far the most active, and aggressive poisonous snake I have seen." Again he says (p. 187): "I may remind the reader that the *Echis carinata* is a very active and fierce little viper, very aggressive, minaceous and irascible * * * in striking the head was always erect, and the whole aspect and attitude was that of intense malice, and mischief."

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* Vol. XVI, p. 504.

† Rept. Brit. Ind., 1876, p. 219.

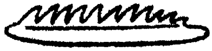
‡ In Epistola.

§ Thanatoph. Ind., p. 16.

Habits.—The curious rubbing movement alluded to by Fayrer is probably peculiar to the genera *Echis*, and *Cerastes*, at least one may presume that *Echis colorata* and the two species of horned viper of Africa behave similarly since they all have the same saw keels and oblique costal scales. *Echis carinata* is the only one of the four that occurs in India.

Mr. Millard alludes to the peculiar movement adopted by this viper in causing the friction of its scales, thus: "It has a curious habit of revolving in almost the figure 8 with its head always in the centre." Fayrer's* plate shows the attitude referred to by Mr. Millard very well.

The hissing noise, and its production are among the most interesting features connected with this snake. From four to seven of the costal series above the penultimate row are peculiarly oblique as seen in our plate. In these rows and these only the keels are serrated, and when the sides of the body rub against one another, the teeth on the opposing faces scrape together, producing a noise so like hissing that the onlooker ignorant of the method in which the sound is really produced may well be deceived. The volume of sound is doubtless very greatly intensified by the habit this snake possesses, in common with many others, of inflating itself under excitement. The result is the production of a column of imprisoned air within, which in this case acts as a resonant chamber. Fayrer remarks that he thinks this viper does not hiss. Whether it does so or not, no ordinary hissing except perhaps that of the Daboia would be likely to be audible during the production of this loud false hissing sound. In Delhi I frequently saw a heap of these



Side view of oblique costal scale to show serrated keel. (After Boulenger.)

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* Loc. cit., pl. XII.

creatures alive in a ghurrah brought to Major Dennys when he was collecting poison for the Indian Government some years ago. When the lid was lifted, several of these creatures, perhaps all, would excite themselves, and begin rubbing their flanks, with the result that the sound produced reverberating within the pot sounded not at all unlike that of a boiling kettle, the effect being distinctly uncanny as no issue of steam accompanied it, and the chatty was cold.

Poison apparatus.—The *fangs* in the Echis are very large for the size of the snake. In a one and a half footer they are probably as long or longer than the fangs in a four foot Krait. The maxillæ are very mobile as in all vipers, allowing the fangs to be rocked forwards and backwards, a trick it is very fond of exercising when yawning, or when grasped by the neck. Fayrer * removed the fangs from a specimen on the 7th October "and noticed particularly that there were no other fixed fangs." On the 11th October he found a fang firmly anchylosed on each side and ready for use. Similar experiments on this and other snakes by the same authority showed the lapse of time to be in most instances considerably longer, but the fact that in one instance only four days was necessary to re-establish this important structure, should impress those who handle poisonous snakes, with the importance of frequently inspecting the jaws if they rely upon the extraction of the fangs for their safety.

Glands.—The poison glands that I have dissected out are perhaps relatively small, but of this I am not sure. They are corrugated externally, not smooth like the glands of the cobra.

Poison.—Physical qualities.—I know of no special observations in this direction. On the few occasions that I have seen this poison in the fluid and solid state "in vitro" without making any special examination it has appeared to me much the same as Daboia venom, the characters of which were given in a previous article dealing with that snake.

Quantity.—I am not certain what the yield of a single gland is, but at a rough guess think it capable of storing, at least, 2 or 3 drops of venom. The actual quantity is difficult to determine, as the glands are so small. When Major Dennys, I.M.S., was collecting poison for the Indian Government in Delhi some years ago, it was found very difficult to collect Echis venom: the yield of many specimens made to bite one after the other into a watch glass gave very meagre results. The method of collecting it was evidently wasteful, for the secretion is free on excitement, sufficiently so at any rate for the venom to trickle down, and form a drop which is ejected when the creature strikes. Thus Miss Hopley[*] says: "When the poison gland is full and the snake angry, you may see the venom exuding from the point of the fang, and by a forcible expiration the reptile can eject it. I have seen this in the little *Echis carinata.*"

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* Loc. cit., p. 140.

Toxicity.—The virulence of the venom is very great, as may be judged from its effects experimentally on the lower animals. A very few instances will suffice to exemplify this. Fayrer[†] (p. 138) records the death of a pigeon in less than 60 seconds after being bitten by an Echis, (p. 138) of a fowl in 70 seconds, (p. 138) another fowl in 2 minutes, (p. 15) of a dog in about 4 hours, and (p. 136) a cobra 3 feet 8 inches long succumbed to the bite of an Echis 23 inches long, 30 hours later. In the last instance Fayrer remarks that there could be no doubt that the cobra died from the effects of the poison. Dr. Imlach[‡] says that the poison introduced into the system of a fowl induces death in about three-quarters of a minute.

Lamb,[§] as a result of most careful experiments with many snake venoms, says that Echis venom has "considerably greater toxicity" than that of Russell's viper.

Physiological effects.—Lamb,[¶] whose researches with this venom are not completed, says that, as far as he has been able to ascertain, the physiological action of Echis venom is similar to that of Daboia venom. He shows that very profound alterations in the quality of the blood result.

Effects of Echis bite on man.—Very conflicting views have been expressed by various authors with regard to the dangers to man of this snake. There are some who deny the lethal effects of its bite, such as Gunther[||]; others think a fatality a very rare sequel, such as Elliot[**], who says he thinks "it just possible that an Echis might kill a child, or a very weakly adult."

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[*] Snakes, p. 351.

[†] Loc. cit.

[‡] Loc. cit. p. 30 *et seq.*

[§] Scient. Memoirs by Officers, Medl. and Santy. Dept., Govt. of India, No. 10, p. 8.

[¶] Loc. cit.

[||] Rept., Brit. Ind., 1864, p. 397.

[**] Loc. cit., p. 13.

There is abundant evidence, however, to show that the bite of the Echis may produce not only the most alarming symptoms, but frequently death. How far the fatal issue may have been contributed to by fright, it is impossible to conjecture; but in the face of the many opinions expressed by those who have experimented with the poison as to the extraordinary virulence of Echis venom, compared with that of other venomous snakes, I see no reason to specially invoke the assistance of fright to account for Echis fatalities.

Dr. Imlach in 1856 wrote : * "The Kuppur is, without exception, the most deadly poisonous snake in Sind." He substantiates the remark by showing that in Shikarpur alone there were 306 cases of snakebite from May to October with 63 deaths, *i.e.*, a mortality of 20·58 per cent. He goes on to say : "a reference to police returns will show that in by far the greatest majority of cases, serious injury and death have been caused by the bite of this species." In 1874 Fayrer,† quoting Gunther's opinion above alluded to, expressed doubts as to its accuracy, remarking on the great virulence of the venom on the lower animals. Further, ‡ he quotes from a letter written to him by Major McMahon from Delhi, who, speaking of this snake, said "they have the reputation of being very deadly, and certainly my old snake man died from the bite of one of his specimens." Later in 1883 Wall § (A J) placed the Echis as the third most dangerous snake, giving the fourth place to the Daboia, the fifth to the banded krait (*Bungarus fasciatus*), and the sixth to the Hamadryad (*Naia bungarus* syn. *Ophiophagus elaps*). He remarks, too, that "there can be no doubt that it contributes very largely to the mortality from snakebite, especially in Northern and Western India."

In 1890 Vidal wrote to this Journal ¶ recording 62 fatalities from this snake in the Civil Hospital at Ratnagiri in the year 1878.

He estimated that about 20 per cent. of the cases of Echis bite proved fatal, and remarks that the poison is slow, death occurring on an average in 4½ days, but that some cases lingered on for 20 days.

He shows later that the Echis is a far more potent factor than any other venomous species in swelling the mortality of the Bombay Presidency. He substantiates the assertion by the very significant observation that in Echis ridden tracts the mortality from snakebite far exceeds that in districts where this snake is comparatively less plentiful. Thus in a table compiled from official returns for 8 years (1878 to 1885) for the districts of the Bombay Presidency, he shows that in the districts of Hyderabad, Thar and Parkar, Karachi and Ratnagiri where the Echis abounds, one man in 5,000 dies per annum from snakebite, whereas in Bijapur, Nasik, Ahmednagar, and Sholapur, where this snake is but little in evidence, only one death from snakebite is recorded for 100,000 of the population.

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* Loc. cit., p. 80.

† Thanatoph. Ind., p. 15.

‡ Loc. cit., p. 128.

§ Ind. Snake Poisons, p. 159.

¶ Vol. V, p. 64, *et seq.*

Murray[*] says "this little viper is very venomous; although the action of its poison is not so quick as that of the cobra, it is equally as potent, and numerous deaths annually occur from its bite."

Mr. Millard has informed me by letter of the case of an attendant in this Society's rooms in Bombay who in October 1903 was bitten by an Echis in the temple. He was taken off at once to hospital, admitted that he felt no fear, but in spite of prompt treatment died 24 hours later.

On the other hand I could quote a large number of cases of Echis bite which (mostly under treatment) recovered after effects of varying severity.

Symptoms of Echis poisoning in man.—The symptoms produced by Echis venom are almost, if not completely, due to the profound alteration the poison works on the constitution of the blood, reducing its coagulability, so that hæmorrhages are most prone to occur. In a case reported by Fayrer[†] of a woman of 30 bitten in the finger at Kotree (Sind), bleeding occurred from the eyes, gums, tongue, nose, vagina, and from beneath the nails of the thumbs, and great toes. In a case reported by Nicholson[‡] a servant bitten at Arconum bled from a cut he had sustained some days before "but which appeared all right" at the time of the bite. Sudden bleeding came on two days after the bite, presumably from the tender scar.

In this Journal Mr. Heath[§] described his symptoms after a bite from this snake. He was seized with violent and repeated vomiting of blood, and had fever also. In two cases which occurred during the Seistan Mission, the notes of which made by Major Irvine, I.M.S., were forwarded to me by Sir A. H. McMahon, profuse bleeding occurred from all mucous surfaces and lasted in one case for a week.

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[*] Reptilia of Sind, p. 57.

[†] Loc. cit., p. 59.

[‡] Ind. Snakes, p. 187.

[§] Vol. XII, p. 784.

In a case under the care of Major Browning, I.M.S., reported by Elliot[*] a woman of 25 was bitten in the finger by a 10-inch specimen at 2-15 p.m. At 8 p.m. she had a sharp hæmorrhage from the bitten part which recurred at 1 a. m. In almost all these cases no constitutional symptoms other than those attributable to the blood were observed. In one case reported by Major Irvine the man almost died on two occasions of fright alone, but eventually recovered. In a case reported by Russell[†] the man is said to have had delirium and spasms, and in Browning's case there was frontal headache. In most cases severe burning pain, and varying degrees of swelling, sometimes very pronounced, occurred locally.

Food.—For information on this subject I am much indebted to Mr. Millard, who has had ample opportunities of ascertaining the character of food preferred by the many specimens kept in captivity in the Society's rooms in Bombay. He tells me they feed readily on mice, centipedes, and scorpions. He has also known them eat frogs, and on one occasion a locust. He also mentions an instance, in this Journal[‡], of one Echis eating another which it subsequently disgorged.

Mr. Thurston writes to me that in the Madras Museum two specimens between the 29th October 1896 and 31st March 1897 ate 8 frogs.

Miss Hopley[§] mentions seeing this snake in captivity in London kill and eat a mouse on two occasions, and remarks that on both occasions it waited till its victim was dead before swallowing it.

Gunther [¶] says he never found anything but scolopendræ (centipedes) in the stomach of this species.

Foes.—Though such a truculent little reptile it is sometimes overpowered by creatures one would expect it to vanquish, or at least to hold its own with. Mr. Boulenger in this Journal [‖] says on the authority of Mr. Mountford that the Sind Krait (*Bungarus sindanus*) is reported to frequently eat the Echis. Jerdon[**] records a sand snake (*Psammophis condanarus*) having eaten one, and Elliot reports a case where the common house rat killed three Echis without suffering in any way. He says. "The snakes each time struck at the rat savagely and repeatedly, but no trace of blood could be seen on the animal." These creatures were all in captivity at Guindy near Madras.

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[*] Loc. cit., p. 40.

[†] Ind. Serp., 1896, Vol. I, Part II, p. 78.

[‡] Vol. XVI, p. 757.

[§] Snakes, pp. 579 and 580.

[¶] Rept. Brit. Ind., 1864, p. 397.

[‖] Vol. XI, p. 74.

[**] Journl. Asiat. Soc., Bengal, Vol. XXII, p. 529.

Breeding.—Though so common a snake the records of its breeding are very meagre. Miss Hopley tells us [*] that in the London Zoological Gardens in 1875 one gave birth to 3 young in July, and mentions that they changed their coats at an early date, but ate nothing.

The only gravid specimen I have had in captivity gave birth in Trichinopoly on the 7th August 1896 to 12 young. These coiled themselves up into a confused heap in one corner of their box, and apart from the mother, who evinced no special concern in her progeny even when they were rudely stirred up with a stick. All of them cast sloughs on the day of birth. The one individual that was measured was 4⅞ inches long. [†]

Sir A. H. McMahon writes to me that he once came across a lot of little ones 3 or 4 inches long at the end of August, and has heard of some more baby Echis being found about Quetta in August. No mother was present on either occasion.

Candy in this Journal [‡] says that in Ratnagiri he made special enquiry, and ascertained that the young are born in April, May, or June but they were reported difficult to find.

Much the most important record of this nature is that reported to me recently by Major O. A. Smith, 27th Punjabis, who witnessed the birth of 3 young on the 6th of August 1907 in Multan. The mother had been 3 weeks in captivity. The first snakeling was born in membranes at 10-40 a. m., and took "a long time" to burst them and force its way out. The second born in membranes at 11-12 took four minutes getting free. The third also born in membranes was discharged at 11-25 a.m., began struggling at 11-50 and was free at 11-53. It was observed that in trying to free themselves they exerted pressure with their snouts against the membrane. After their birth "a lot of jelly-like substance whitish in colour was passed out," which I think may have been a non-fertile egg. During birth it was noticed that a globular bag containing orange-coloured fluid first gained exit, increasing in size, and expanding the cloaca till the rest of the bag containing the coiled embryo escaped. The young were "proximately 4½ inches long." They drank water given them at the end of a penholder. The mother died a week or so later.

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[*] Snakes, pp. 440 and 579.

[†] Referred to in this Journal, Vol. XIII, p. 184.

[‡] Vol. V, p. 86.

Sloughing.—Fayrer* says, referring to some specimens he had had in captivity, "it is a remarkable thing that none of these Echis have shed their epidermis since they came here three months ago; not a trace of a slough is found in their cage." The remark was made on the 15th October.

Distribution (*a*) *Local.*—It is essentially a creature of the plains but may be met with up to probably 6,000 feet elevation. I have seen a specimen from Suleik (Aden Hinterland 2,000 feet) in our Society's Collection. Nicholson† records a single example among 1,225 poisonous snakes brought for rewards in 1873 at Bangalore (circa 3,000 feet). I met with it about the Malakand (2,000 to 3,000 ft.). Mr. C. H. Whitehead sent me a skin from Parachinar, N.-W. F. (5,760 feet), and says they are common there.

(*b*) *Geographical.*—I attach two maps to indicate the habitat of this snake. In Map 1, I have shown the limits of its distribution as at present known in Africa and Asia. The red lines are the boundaries of regions (uninterrupted) and subregions (dotted) as laid down by Blanford in 1866 and 1880. In making a comparison, however, one must bear in mind that his delimitations were based upon the distribution of mammals, and that the knowledge derived during twenty-eight years since he wrote may have modified the confines of these boundaries, but of this I am not in a position to speak authoritatively.

So far as Africa is concerned, Boulenger ‡ records the habitat as follows:—Desert, and sandy districts north of the Equator. The most southern record on this continent is Somaliland on the East Coast (British Museum specimen); the southern boundaries elsewhere are, I believe, not exactly known.

In Asia it occurs in Arabia, Persia, Afghanistan, Baluchistan, and India. It is probably found throughout Arabia, as Gunther § records specimens from Midian on the north-eastern shores of the Red Sea,

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* Loc. cit., p. 141.

† Loc. cit., p. 173.

‡ Cat. Snakes, Brit. Mus., Vol. III, 1896, p. 505.

§ P. Z. S., 1878, p. 978.

our Society has a specimen from Aden Hinterland, the British Museum has examples from the south (Aden and Hadramaut) and the east coast (Muscat). The exact northern boundary is as yet not known. It probably occurs throughout Persia, its north-western limits being, I believe, not precisely demarcated. It extends beyond Persian limits to the north, a specimen in the British Museum having come from Askabad in Transcaspia.

It occurs throughout Baluchistan and Afghanistan, the northern limits in the latter country being uncertain.

In India its distribution is shown in Map 2, and it will be observed that in the northern part of the Punjab the boundaries are not clearly defined. Again, the Ganges appears to be the boundary in North-Eastern India. It does not appear to inhabit the southern part of the Malabar Coast. The northern boundary of this tract is conjectured by Blanford to be the Tapti River, but the Echis occurs plentifully well below that river (Ratnagiri).

So far as Ceylon is concerned, though Boulenger makes no special reference to this island in its habitat, I think there is little, if any, doubt that it occurs in the Northern Province, the fauna of which, according to Blanford and others, agrees with that of Southern India to the east of the Western Ghats. Ferguson[*] says: Mr. E. Wytealingam of the Medical Department, an industrious and excellent collector of our reptiles, has recently sent about a dozen specimens of this small viper from Mullaitivu, thus proving that it is a common snake in that part of the island. Haly[†] notes against this species: "Two specimens (very bad state) from Mullaitivu, presented by W. Ferguson, Esq." Mr. W. Ferguson, with whom I was personally acquainted for some years, was an excellent observer and not likely to make a mistake about a snake so easy to identify. I have given in Map 2 all the localities with which I am acquainted in Indian limits from which it has been reported.

Its abundance in various parts of India differs considerably. In many localities it is specially common, but probably nowhere more so than in and about Ratnagiri, where it exists, according to Vidal and Candy, in numbers almost incredible. The former in this Journal[‡] says that in the Ratnagiri District alone during 6 years

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[*] Rept. Fauna of Ceylon, 1878, p. 25.

[†] First report of the Collection of Snakes in the Colombo Museum, 1886, p. 18.

[‡] Vol. V, p. 64.

Government rewards were paid on an average of 225,721 phoorsas per annum. Later he remarks that when the Government reward was raised tentatively from six pies to two annas per head, 115,921 were paid for in 8 days (December 2nd to 18th, 1862). Again Candy in the same issue (page 85) says that in Ratnagiri, in August and September, the Mhars go out with long sticks to which forks are attached, and catch them in thousands for Government rewards. I doubt whether any other snake or perhaps even this one abounds in such prodigious numbers in any other part of India. Vidal shows that in the Districts of Hyderabad (Sind) and Thar and Parkar (Sind) it is also specially numerous. Alcock and Finn reported it common along the line of march to the Persian Frontier when delimiting the Afghan-Baluch boundary. Sir A. H. McMahon tells me that it is common throughout the N.-W. Frontier, extending up the Indus Valley as far as Chilas. He also says it is very common in Baluchistan and Seistan. Mr. C. H. Whitehead writing from Parachinar on our N.-W. Frontier says (at 5,760 feet) it is quite common. Colonel R. Light [*] reported several casualties from this viper in Bhuj (Cutch), so that it is evidently common there. Fayrer [†] remarks "it is common in the North-West Provinces, Central Provinces, and generally in the South of India." Jerdon [‡] says it is very common in the Carnatic. Personally I have known it very common about Trichinopoly and Delhi, and met with several specimens in Malakand.

Description.—*Rostral.* Touches 6 shields; the rostro-nasal sutures two or three times longer than the rostro-internasals: height about half the breadth. *Internasals.* A pair of small shields, the fellows in contact. *Supraoculars.* Usually present, sometimes more or less divided. *Nasals.* Divided into an anterior and posterior shield or semi-divided; touching the 1st supralabials; nostril small, placed in the upper, and posterior part of the nasals. *Supralabials.* 10 to 12, the 4th largest usually (sometimes the 3rd). *Infralabials.* 4 (3), the 4th (3rd) largest. *Sublinguals.* One well developed pair touching 3 or 4 infralabials, andf our scales behind. *Costals.* Two heads-lengths behind head 23 to 29, midbody 26 to 35, (37 Boulenger) two heads-lengths before vent 21 to 27; all rows except

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[*] In Epistola.

[†] Loc. Cit., p. 16.

[‡] Journl., Asiat. Soc., Bengal, Vol. XXII., p. 824.

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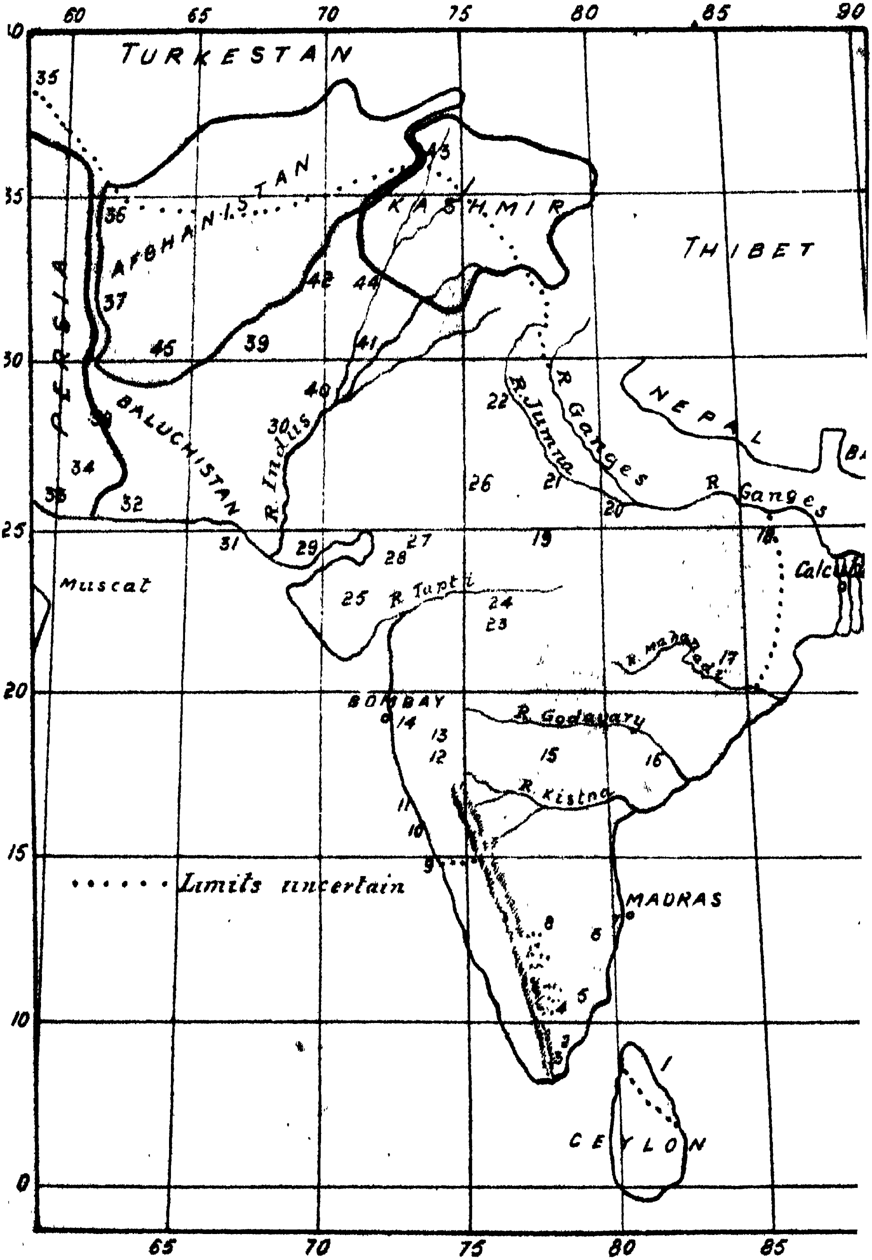
* In Epistola. † Loc. Cit., p. 16.

‡ Jourl., Asiat. Soc., Bengal, Vol. XXII., p. 324.



Map 2 – Distribution of Echis carinata

the ultimate keeled, the penultimate faintly, and in the 4 to 7 oblique rows above this the keels are serrate.

The ultimate row is the largest, the penultimate rather smaller, the oblique rows narrow, and remaining dorsal rows subequal and small. *Supracaudals.* Keeled to tail tip. *Ventrals* 132 to 192 (Boulenger): broad, stretching right across belly, so that when the specimen is laid on its back, only part of each ultimate costal row can be seen on each side; not keeled. *Anal.* Entire. *Subcaudals.* 21 to 48 (Boulenger): entire.

DETAILS OF MAP 2.

Distribution of Echis carinata.

1. Mullaitivu.—Ferguson. Rept. Faun. Ceylon, 1877, p. 25.
 Haly. First Report Snakes. Colombo Mus., 1886, p. 18.
2. Ramnad.—Dr. Annandale. Indian Museum.
3. Tinnevelly.—Millard. Bombay Collection.
4. Anamallays.—Boulenger. British Museum.
5. Trichinopoly.—Wall.
6. Arni.—Russell. Ind. Serp., Vol. 1, p. 3.
7. Madras.—Boulenger. British Museum.
8. Bangalore.—Nicholson. Ind. Snakes p. 173.
 Sclater. List 1891. Indian Museum.
9. Karwar.—Millard. Bombay Collection.
10. Deogad.—Candy. Bombay Jourl., Vol. V, p. 85.
 Liston. Parel Laboratory (In epistola).
11. Ratnagiri.—Vidal. Bombay Jourl., Vol. V, p. 70.
12. Mahableshwar.—Boulenger. British Museum.
13. Poona.—Millard. Bombay Collection.
14. Andheri.—Young. Bombay Jourl., Vol. XVI, p. 504.
15. Deccan.—Boulenger. British Museum.
16. Ellore.—Blanford. Jourl. Asiat. Soc., Bengal, Vol. XLVIII, p. 116.
17. Singbhum.—Anderson. Jourl. Asiat. Soc., Bengal, Vol. XL, p. 37.
18. Rajmahal.—Sclater. Ind. Museum.
19. Nowgong.— ,, ,, ,,
20. Allahabad.— ,, ,, ,,

21. Agra.—Sclater. Ind. Museum.
22. Delhi.—Wall. Fayrer. Thanatoph., 1872, p. 123.
23. Mhow.—Millard. Bombay Collection.
24. Rutlam.—Heath. Bombay Journl., Vol. XII, p. 785.
25. Guzerat.— „ „ „ Vol. XIII. p. 340.
26. Ajmere.—Blanford. Journl. Asiat. Soc., Bengal, Vol. XLVIII, p. 127.
27. Mount Abu.—Sclater. Ind. Museum.
28. Deesa.—Boulenger. British Museum.
29. Bhuj.—Col. Light (In epistola).
30. Shikarpur.—Dr. Imlach. Trans. Medl. and Phys. Soc. of Bombay, 1855, No. III, p. 80.
31. Karachi.—Sclater. Indian Museum.
32. Dasht.—Sclater. Indian Museum.
33. Jask.—Boulenger. British Museum.
34. West of Bampur.—Boulenger. British Museum. (Persia not Baluchistan as given by Boulenger, Cat. Vol. III, 1896, p. 507.)
35. Ashkabad.—Boulenger. British Museum.
36. Tirphul.—Sclater. Indian Museum.
37. Seistan.—Boulenger. British Museum.
    Annandale. Indian Museum.
38. Perso-Baluch Frontier.—Alcock and Finn. Journl. Asiat. Soc., Bengal, Vol. XLV, p. 565.
39. Quetta.—Mc Mahon (In epistola).
40. Rajanpur.—Sclater. Indian Museum.
41. Multan. Major Smith (In epistola).
42. N.-W. Frontier, Malakand—Wall. Parachinar, Whitehead (In epistola.) "Common throughout", McMahon (In Epistola).
43. Chilas.—McMahon (In epistola).
44. Salt Range.—Sclater. Indian Museum.
45. Between Nuskhi and River Helmand.—Boulenger. British Museum.

I have not been able to exactly locate the following :—

Patchia in Rajputana. Sclater. Ind. Museum.
Chilgez in Afghanistan. Boulenger. British Museum.
Muckerabad in Persia. Boulenger. British Museum.
Kalagan in Baluchistan. Sclater. Ind. Museum.

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J. Green Chromo

THE BROWN TREE-SNAKE.
Dipsas trigonata. (harmless).

THE GAMMA, OR COMMON BROWN TREE-SNAKE.

(*Dipsadomorphus trigonatus.*)

(*Dipsas trigonata*).

Nomenclature.—(*a*) *Scientific.*—The generic name is from the Greek "Dipsas", a species of snake, and "morphe" form, implying a similitude in form to that of the Dipsas. Under the name Dipsas* many snakes were included by the older writers, which modern herpetologists consider separable into many distinct genera. The name is now retained to designate the genus of the original snake to which it was applied by Laurenti in 1768, a South American species, *viz.*, *Dipsas bucephala.* The other forms now considered distinct have had to be rechristened, and among them the genus to which the species under discussion belongs.

The title now retained for it by Mr. Boulenger originated with Fitzinger in 1843, and was applied by him to this species. It is very doubtful, however, whether this name will stand, as the same authority gave the name *Boiga* to the species *irregularis* of this genus in 1826 as shown by Stejneger † recently.

There seems little doubt that the name of the genus will have to be changed to *Boiga*, but I refrain from doing so here, as I follow in Mr. Boulenger's footsteps in nomenclature in these papers.

The specific name *trigonatus* is from the Greek "tri" three, "gonia" angle, and is applied to the peculiar markings on the body, which often very obscure appear to me to much more resemble the Greek letter γ than triangles. The name was introduced by Schneider for this species in 1802.

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* This name was evidently borrowed from the ancients who applied it to some snake, the identity of which is at the present day probably not known. It was reputed to be venomous and according to some, one of the effects of its bite was an insatiable thirst (Gr. "Dipsa" thirst), though Lucan makes it appear that it was the creature itself that was afflicted with thirst. Thus in his Pharsalia written in the first century A. D he alludes to it on the occasion when Cato was leading his army across the desert. The passage has been thus translated :

> And now with fiercer heat the desert glows,
> And midday gleamings aggravate their woes,
> When, lo! a spring amid the sandy plain
> Shows its clear mouth to cheer the fainting train.
> But round the guarded bank in thick array
> Dire aspics roll'd their congregated way,
> And thirsting in the midst the Dipsas lay.

† Proc. Biol. Soc. Washington, XV., 1902 p. 16.

(*b*) *English.*—I know of no English name in general use but have seen it alluded to as the Common brown Tree-Snake in some books. This title is too long and it is doubtful whether it might not be equally applicable to its larger brother species *D. forsteni.* I would suggest the name Gamma snake, the markings on the body in a typical specimen are very like the Greek letter γ and specially those on the left side. On the right, however, the long stroke of the letter is sloped the wrong way.

(*c*) *Vernacular.*—The name quoted for it by Russell* about Vizagapatam is "Tar tutta". In Malabar it was frequently called "Choorta".

Dimensions.—It grows to two-and-a-half feet.† The longest of some 25 measurements made by me were 2'-7", 2'-6½", 2'-6½" and 2'-6", and all of these specimens were females. The largest ♂ of some 20 examples in which I have recorded the sex was 2'-1¾". I had another ♂ 2'-0¾".

Physiognomy and Bodily Configuration.—The head is subcordate or subtriangular in shape, being widest at a point about midway between the eyes and the neck, and is flattened (*i.e.*, depressed). The snout is rounded; the laterally placed nostrils occupy the second and third-fifths from above downwards of the suture between the nasals and are wholly or almost wholly contained in the anterior of these shields. The eye is large, the iris copiously flecked with mustard yellow, and the pupil vertical. The neck is very constricted, probably (in common with others of this genus) more so than in any other colubrine snake within our limits. The body is slender throughout; it increases gradually in girth from the slender neck, and as gradually attenuates towards the vent. Its vertical markedly exceeds its lateral measurement (*i.e.*, the body is compressed). The tail is evident, especially so in females, a considerable reduction in girth occurring at the vent. It is of moderate length, varying from rather more than one-seventh to one-fifth the total length, and is distinctly longer in females than males, a peculiarity I have not noted in the species of any other genus, but which will probably be found to be the same in others of this genus. In all other snakes where a sexual disparity is noticeable I have found the length greater in the males.

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* Ind. Serp., 1796, p. 20, and Plate XV.

† Blyth (Journal Asiatic Soc., Bengal, Vol. XXIII, p. 294, footnote) says that it attains to about 6 feet, but this is obviously a mistake, probably a printer's error, for his record of the length of the young, *viz.*, about 9 inches, is in accord with my own supposition and in consonance with the proportions of hatchlings in other snakes of dimensions similar to that given by me for this species, *viz.*, two-and-a-half feet.

I may here remark upon the very striking resemblance this snake with others of this genus bears to some vipers. The shape of the head, the vertical pupil, and the constricted neck are typically viperine, to which may be added the method of striking, to which I shall refer hereafter. On the other hand, it is noticeably different from vipers in the large plaque-like shields of the head, in the profile outline of the commissure of the mouth which does not show that marked downward curve corresponding with the position of the viperine fang, and in the slenderness, length, and compression of the body. The tail, too, is relatively longer in *Dipsadomorphus*. The viperine similarities affect the very features which most readily attract the eye; the dissimilarities on the other hand are far less noticeable to one unfamiliar with these creatures.

Colour and Markings.—The ground colour is usually of a light yellowish-brown, sandy, or fawn hue which may be uniform, or, more or less mottled with darker shades, specially low in the flanks or sparsely scattered with black spots. Dorsally a series of dark more or less distinct ʏ shaped marks occur on each side, which fade posteriorly, ending at or before the vent. The shade between the arms of each ʏ is lighter, often indeed whitish. Where the series of one side exactly meets the fellows of the other on the spine, as frequently happens in part if not the whole length of the body, these marks resemble arrowheads. Blyth* says the very young are pale with but slight traces of the adult marks, but I cannot say that my young specimen was much, if at all, different from adults. I have noticed that the skin between the scales is dun, and somewhat darker in the gamma marks, and in sloughs these marks are obscurely traceable.

A specimen I got in Delhi was much the colour of tea and milk, and was copiously specked with very fine punctiform dark spots, the gamma marks being very obscure.

The head bears a pair of large lung-shaped brown patches, often delineated with black, and a narrow dark streak passes from behind the eye towards the gape. Annandale † mentions a variety from the

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* Loc. cit.

† Journl. Asiat. Soc. Bengal, Vol. LXXIII, p. 209.

Perso-Baluch frontier many specimens of which were collected by Sir A. H. McMahon in which the head was sooty black, especially in the young, and suggested the name *melanocephalus* for it.

Breeding.—My own notes supply all the information on this point, and though the incidents within my experience are few, a good deal may be inferred from the scanty material available.

My smallest prospective mother was 1 foot $8\frac{3}{8}$ inches in length in June. This length would be attained in the third year of age, and from an ophidian point of view the age is an unusually early one for breeding. My other gravid specimens were four years old at least.

It is fairly obvious that the species is not a very prolific one from the snake stand point. 10 was the largest number of eggs found in abdomina, and in three other cases there were 3, 5 and 6 respectively. The eggs are probably discharged as such in August and September. I am fairly certain the species is ovoviviparous, and have good reason to believe that at the time of deposition the eggs contain embryos in a very early stage of development, but of this I cannot speak positively yet. The eggs are long white ovals, the poles of each equally domed, the shell white and leathery. I have measured them in one case $\frac{7}{8}$ inch long by $\frac{1}{2}$ inch broad, in a Bangalore specimen; date of capture not known. In another killed in August they were $\frac{17}{20}$ of an inch, and in a third in August $\frac{18}{20}$ of an inch. Both the last were obtained in Fyzabad. In the Bangalore specimen, which had been preserved in spirit, the 10 eggs lay in a single string, which occupied $8\frac{1}{2}$ inches of a body 2 feet and $\frac{3}{4}$ of an inch long (*i. e.*, exclusive of tail). The poles of each were flattened against one another from pressure. The young it may be presumed from analogy emerge from the egg two months or so after deposition, but of this I can only speak hypothetically. If I am correct in my belief that the embryo is partly developed when the eggs are extruded, the usual term of incubation may be curtailed. Hatchlingsare, I believe, about 9 inches in length. Blyth, too, gives this measurement for the young. It is perhaps remarkable that of more than 30 specimens collected by me I have only had one young one. This measured $9\frac{3}{8}$ inches on the 13th March in Trichinopoly. My next largest specimen was 1 foot $8\frac{1}{2}$ inches.

The young appear to grow about 6 inches a year.

Identification.—Attention must be directed to the following. The scales are in 21 rows anteriorly, *i.e.*, two heads lengths behind the head, 21 in mid body, and 15 posteriorly, *i.e.*, two heads lengths before the vent. This arrangement is only to be found in certain species of this genus and some pitvipers, *Lachesis gramineus*, etc. The enlarged plates on the head will eliminate all the vipers which share the scale peculiarities just noted, and thin the diagnosis down to 5 species of *Dipsadomorphus*,* viz., *trigonatus*, *hexagonotus*, *ceylonensis*, *cyaneus* and *multifasciatus*. *Trigonatus* has the vertebral row of scales feebly enlarged in the middle of the body, and fewer subcaudal shields, *viz.*, 75 to 92. In the rest, excepting *multifasciatus*, the vertebrals are as broad as long in the middle of the body, and in *multifasciatus* the subcaudals vary from 96 to 114.

To sum up diagnosis rests on—

(1) The scales being 21, 21, 15.
(2) The head covered with large plates.
(3) The feeble development of the vertebrals in midbody.
(4) The subcaudals 75 to 92.

Disposition.—This with others of its genus is one of the most intrepid snakes I know. Often with no further provocation than being suddenly disturbed or confronted, it will assume an attitude of defiance and with little hesitation boldly act on the offensive. The attitude it adopts at these times is very characteristic. The head and forebody are erected well off the ground, and the latter thrown into loops of which two overlapping one another are thrown to one side and one on the other, the head being poised in the middle of the figure of 8 so formed. The rest of the body lies variably disposed in sinuous extension. Prior to its hasty stroke the erected part is swayed slightly forwards and backwards, whilst the body is inflated and deflated with agitation, and the tail briskly vibrated with emotion. Poised thus, intently watching the object of its alarm for a favorable opportunity to deliver its thrust, the little creature reminds one of the behaviour of a wrestler seeking with the utmost vigilance to engage his adversary advantageously. The stroke is delivered with great malice, the jaws opening widely in the act of striking, and the forward thrust is no sooner accomplished than the creature retracts itself to reassume its former attitude, and strikes again and again—in fact, will sometimes do so till its energies are spent. During the thrust the loops are straightened to their utmost, and a two-foot snake may dart at and strike an object six inches or even more in front of it.

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* Many of the species in this genus are so closely alike in scale characters that it is difficult to separate them, consequently some have been much confused by some authors. After the number of scale rows, the development of the vertebrals, and the number of the subcaudals, the next most important point to demand attention appears to be the posterior sublinguals the fellows of which are in contact in some of the species, separated completely by small scales in others. Whether this will be found quite constant in the various species remains open to question. The reflection of the praeocular on to the top of the head or otherwise, appears to me of uncertain value, being subject to variation in individuals of some species. The actual contact of this shield with the frontal is also variable.

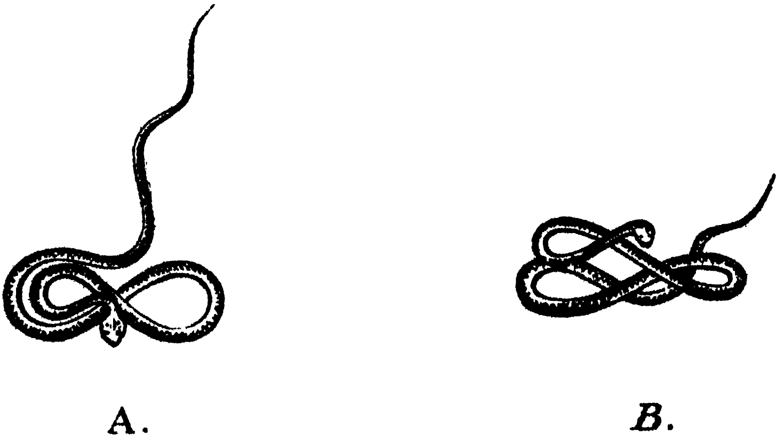

Fig. 3

A. D. trigonatus seen from above poised before striking.

B. do seen from in front poised before striking.

I have several times tried to get this and others of this genus photographed in the peculiar attitude just referred to. The last occasion was in Fyzabad, but in my attempts to get the right pose I was struck at again and again until the specimen lay over on its side completely exhausted, and I picked it up with no more fight in it and restored it to its box. The next day it repeated the same performance with a similar climax. Such determination and courage in so small a creature are worthy of the greatest admiration.

Its attitude before striking is very similar to that displayed by the pit vipers *Lachesis gramineus* and *L. anamallensis*. I have tried to show this in the accompanying diagrams.

Food.—Like other ophidians the Gamma snake takes almost anything it can get, but it shows a strong partiality in its natural haunts for lizards, especially those of the genus Calotes and other Agamoid forms. Gunther* says it feeds on mice, but I have known it do so on only one occasion. In captivity Mr. Millard tells me "it feeds freely on small birds, lizards, and mammals, killing them by constriction in the same manner as the Python." It would appear to be capable of utilising its tail to some purpose in the same direction, for Russell † relates the following experience :—"In the month of December, a vigorous subject of this species was made to bite a chicken which he did very fiercely and repeatedly in different parts * * *. The chicken at first fluttered, and screamed with pain, but soon became quiet. In about half a minute, greatly to my surprise, she let fall her head, and shut her eyes as if dead. The position of the wing prevented the cause of this being at first discovered. The snake imperceivedly had wreathed its tail round the chicken's neck, and the bird, had it not been rescued, would inevitably have been strangled. Soon after being disengaged, it recovered perfectly."

Distribution.—(*a*) *Geographical.*—The distribution of this species is very similar to that of the Echis, as will be seen by the accompanying map. In India it will be noted that it inhabits that little tract of territory on the Malabar Coast in which the Echis appears to be absent, and also extends to the north of the river Ganges unlike Echis. It probably reaches the base of the Eastern Himalayas, but its exact limits to the East beyond Assam are unknown. Anderson‡ records it from Assam and the Naga Hills, and there are two specimens in the Indian Museum from the Khasi Hills (Shillong). Compared with the range of Echis its more extensive eastern distribution is compensated for by a more restricted habitat to the west. In the Mediterranean sub-region it extends like Echis into Transcaspia, but its limits to the west are doubtful. I can find no record west of the Perso-Baluch frontier. There appears to me no doubt that it occurs in Ceylon, though Boulenger* does not mention this locality, and Willey† does not include it among the ophifauna of that island. Ferguson‡, however, says "of specimens sent to be named by Dr. Gunther, he is returning one named *Dipsas trigonata*, Boie." It is possible that like Echis it may be confined to the north-eastern part of the island. Were it universally distributed one would expect the Colombo Museum to have representatives on their shelves. The specimen referred to by Ferguson has been apparently lost sight of.

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*Rept. Brit. Ind., 1864, p. 312. † Ind. Serp., Vol. 1, p. 21.

‡ Journl. Asiatic Soc., Bengal, Vol. XL., p. 35.

(*b*) *Local.*—It appears to be essentially arboreal in habit, frequenting bushes, scrub, or trees usually in close proximity to the ground, though it will climb to considerable elevations at times. I have frequently come across its sloughs low down in lantana and similar tangled vegetation. It often descends to the ground, and I have several times met with it at night in the open, on the road, or a garden path. At this time it always appeared to be on the move, but I have had several examples brought to me found coiled up on the ground beneath a bush during the day time apparently asleep.

In bushes it coils itself into a little heap, unlike the tree snakes of other genera which recline with the body extended in graceful curves distributing their weight on many points, unless they are actually resting in their major or full length along a suitable branch.

In this Journal § Nurse reports having frequently seen it in Guzerat, where it appears to be very abundant, curled up on the top of cactus hedges.

It sometimes takes up its abode (perhaps for the deposition of eggs) in a hole in a tree trunk, and in one instance one had evidently recently tenanted a crypt in the crevices of a wall, as its slough was seen partly issuing from a hole in the face of the brickwork.

After the foregoing observations it will appear remarkable that such a creature can adapt itself completely to a desert environment, but such is undoubtedly the case, for Blanford ‖ records one from Gwadar in Baluchistan which he says is merely a fishing village on a barren spit of sand between a rocky promontory and the mainland where there is not a single tree and scarcely a bush to be found.

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* Spol. Zeylan., April 1906, 283.

† Cat. Vol. III, 1896, p. 68.

‡ Reptile Fauna of Ceylon, 1877, p. 21.

§ Vol. XIII, p. 340.

‖ Journl., Asiatic. Soc., Bengal, Vol. XLVIII, p. 181.

It appears to be a particularly common snake about Vizagapatam according to Russell,[*] as many as half a dozen being found in a night crossing the road. At Berhampur a little to the north of this I met with it fairly often, but never in such numbers, nor have I found it as common in any other part of India as Russell reports it from Vizagapatam.

Description of lepidosis.—Rostral.—Touches 6 shields, the sutures it makes with the anterior nasals twice or three times those made with the internasals. *Internasals.*—A pair; the suture between the fellows from three-fifths to two-thirds that between the præfrontal fellows and about two-thirds to three-fourths the internaso-præfrontal sutures. *Præfrontals.*—A pair; the suture between the fellows, subequal to the præfronto-frontal sutures: touching the internasal, postnasal, loreal, præocular, supraocular, and frontal. *Frontal.*—Length subequal to the supraoculars, breadth in a line connecting the centres of the eyes about one-third to one-fourth greater than supraoculars: touching six shields, the fronto-supraocular sutures about one fourth longer than the rest. *Nasals.*—Completely divided; touching the 1st and 2nd supralabials. *Loreal* small, squarish. *Præoculars.*—One just reaching the top of the head but not meeting the frontal. *Postoculars.*—Two. *Temporals.*—Small, scale-like, anteriorly usually two, sometimes one or three. *Supralabials* normally 8 with the 3rd, 4th and 5th touching the eye. *Infralabials.*—Usually 7, the last 3 or 4 touching the posterior sublinguals; the 1st meeting to make a suture subequal to that between the anterior sublingual fellows; the 7th much the largest, and in contact with three scales behind. *Sublinguals.*—Two pairs of subequal size or the posterior rather longer; the posterior fellows in contact anteriorly usually. *Costals.*—Two heads lengths behind the head 21, midbody 21, two heads lengths before the vent 15. The absorption of rows is peculiar; at the step from 21 to 19, which occurs shortly after the midpoint of the body, the uppermost lateral row disappears and is almost always absorbed into the vertebral, with the result that at this spot the vertebral becomes suddenly larger, and especially so if the absorption occurs on both sides simultaneously. I have known it absorbed into the row below. At the second step from 19 to 17, which occurs very close to the first, the 4th row above the ventrals fuses with either the 3rd or the 5th. At the third step from 17 to 15 the uppermost lateral row is absorbed into the vertebral, and again a sudden enlargement in the vertebral row results. Steps one and two are occasionally reversed. The vertebral row is enlarged throughout, but anterior to the first absorption the shield are but slightly enlarged whereas later they are relatively much broader. This enlargement ceases above the vent where the rows of scales reduce, and become redisposed, even numbers of rows replacing the odd number seen in the body. This arrangement is in strong contrast to that seen in the Kraits (*Bungarus*) where the vertebral row also enlarged is continued as such along the whole of the tail. The last three rows above the ventrals are all enlarged, the ultimate most so. This is a peculiarity I have only seen in members of this genus. The outline of the transverse series of scales is as a result characteristic as shown by the thick lines in figure 2A. Keels are absent everywhere, but each scale bears a single apical pit. Where the vertebral row is but feebly enlarged, a single pit is in evidence, but where through absorption it becomes broad, two or rarely three pits may be seen. *Ventrals* 206 to 238, rounded, and reflected unusually high in the flanks, to about one-third the body depth. *Anal* entire. *Subcaudals* 75 to 96 divided.

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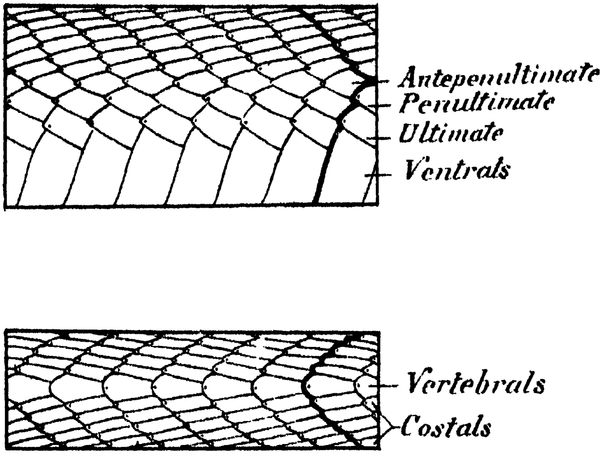
[*] Ind. Serp., Vol. I, p 21.

Explanation of abbreviations used in lepidosis, fig. 1, Diagram II,

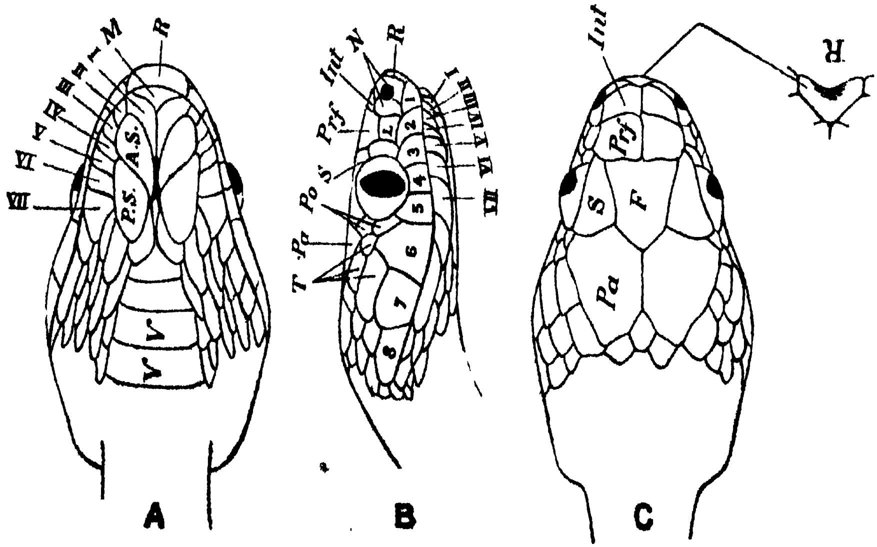
(*D. trigonatus*).

A. S.	Anterior sublingual.
F.	Frontal.
Int.	Internasal.
L	Loreal.
M.	Mental.
N.	Nasal.
Pa.	Parietals.
Po.	Postocular.
Prf.	Præfrontal.
R.	Rostral.
S.	Supraocular.
T.	Temporal.
V.	Ventrals.
1 to 8.	Supralabials.
I to VII.	Infralabials.



B

Fig. 2.

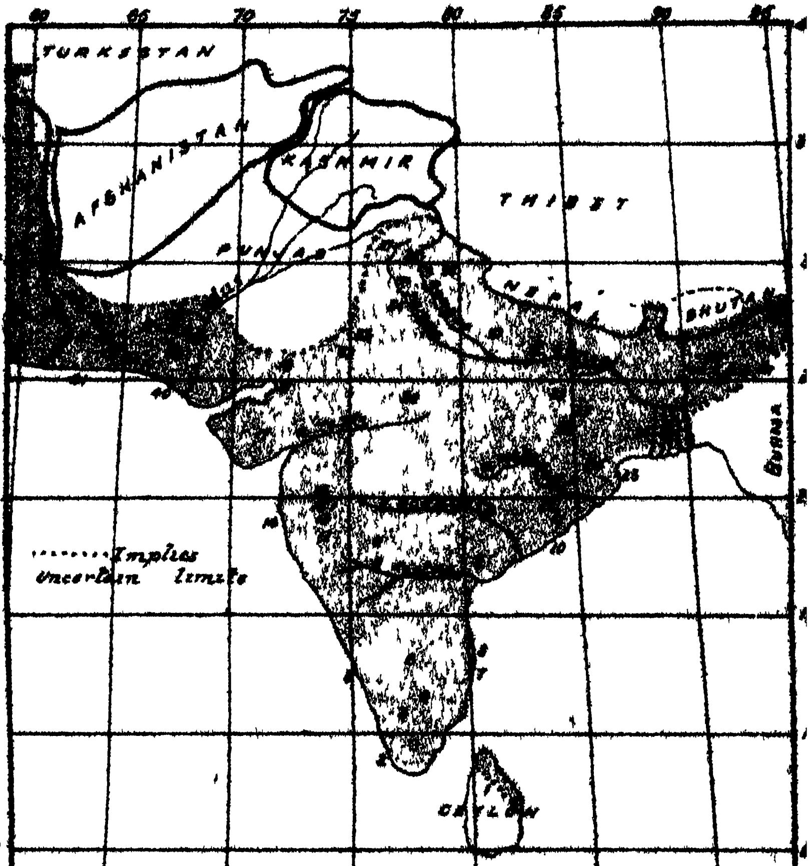


A B C

Dipsadomorphus trigonatus. (×3)

Fig. 1.

INDIAN SNAKES *(Wall).*



Map 3 — Distribution of Dipsadomorphus trigonatus.

Key to Distribution Map of Dipsadomorphus trigonatus.

1. Ceylon.—Exact locality not specified. Ferguson Rept. Fauna, Ceylon, 1877, p. 21.
2. Trevandrum.—Ferguson. Bomb. Jourl., Vol. X, p. 73.
3. Anamallays.—Boulenger. British Museum.
4. Trichinopoly.—Wall.
5. Cannanore.—Wall.
6. Bangalore.—Sclater. Indian Museum.
7. Pondicherry.—Boulenger. British Museum.
8. Madras.— " " "
9. Ellore.—Blanford. Jourl. Asiat. Soc., Bengal, Vol. XLVIII, p. 115.
10. Vizagapatam.—Russell. Ind. Serp., Vol. I, p. 21.
11. Sholapur.—Millard. Bombay Collection.
12. Poona.— " " "
13. Khandala.— " " "
14. Bombay.— " " "
15. Igatpuri.— " " "
16. Nasik.— " " "
17. Guzerat.—Bombay Jourl., Vol. XIII, p. 340.
18. Karaghora.—Millard. Bombay Collection.
19. Ahmedabad.— " " "
20. Nowgong.—Sclater. Indian Museum.
21. Berhampore.—Wall.
22. Aska.— Sclater. Indian Museum.
23. Balasor— " " "
24. Manbhum.— " " "
25. Calcutta.— " " "
26. Chakardapur.—Annandale. Indian Museum.
27. Purnea.—Sclater. Indian Museum.
28. West of Barakhar.—Anderson. Jourl. Asiat. Soc., Bengal, Vol. XL, p. 35.
29. Shillong.—Annandale. Indian Museum.
30. Naga Hills—Anderson. Loc. cit.
31. Fyzabad.—Wall.
32. Ajmere.—Sclater. Indian Museum.
33. Jaipur.— " " "

34. Delhi.—Wall.
35. Kumaon.—Boulenger. British Museum.
36. Mussoorie.—Wall.
37. Sabathu.—Sclater. Indian Museum.
38. Sehwan.—Murray. Rept. of Sind, p. 51.
39. Kotri.— „ „ „ „
40. Karachi.— „ „ „ „
Boulenger. British Museum.
41. Gwadar.— „ „ „
42. Perso-Baluch Frontier.—Annandale. Indian Museum.
43. Puli Hatun. Transcaspia.—Boulenger. British Museum.

(To be continued.)

BEAN-GEESE OF ASIA.

BY

S. A. BUTURLIN.

When writing on the subject in No. 3, Vol. XVII, of this Journal, I did not intend to discuss the matter further, hoping that this distinguished Ornithologist, Mr. Eugene W. Oates, having access to the scientific treasures of the British Museum, will settle the open questions at once by publishing full particulars on types of *Anser serrirostris*, Swinh., and *A. oatesi*, Rickett. Unfortunately Mr. Oates in his last paper (No. 4, Vol. XVII, p. 950 of this Journal) only repeats his former conjectures, and leaves *A. oatesi* as it is, practically an undescribed species, though technically not a *nomen nudum*.

Therefore I have worked out a careful scheme of measurements to make, and different points of feathering to examine, and asked Mr. Henry E. Dresser to examine type specimens of the geese above referred to.

With his usual friendly kindness Mr. H. E. Dresser measured and compared the types, recording the results. Comparing the information thus received with my ample series (more than fifty) of the Bean-geese of Kolyma's delta I can now state quite positively: 1st, that *Anser oatesi*, Rickett, is only a synonym of *A. serrirostris*, Swinhoe; 2nd, that it has nothing to do whatever with *A. brachyrhynchus*, Baill.; 3rd, that Kolyma birds are true *A. serrirostris*, Swinh.; therefore 4th, that *A. serrirostris*, Swinh., has the pale preapical band of the bill *yellow*.

In the following table I give measurements—in millimetres—of the following specimens :—

I.—*Anser brachyrhynchus*, Baill., ♂ ad., No. 348, 19th June 1900, Spitsbergen, coll. by Svensk. Zool. Polar Exped., in my own collection, measured by me (as all other, when not otherwise stated). This specimen, so far I could ascertain, is *the largest* on record.

II.—*A. carneirostris*, Buturl., ad., No. 4672, 15th April 1906, Ufa Governm. Eur. Russia, coll. by Count A. Tolstoi, in my collection.

III.—*A. segetum*, Gm., ad., No. 306, middle of June 1901, Pechora ("Petchora") estuary, by Mr. A. Novossilzev, in my collection.

IV.—*A. segetum*, Gm., maximum dimensions as given by Mr. S. N. Alphéraky in his work "Geese of Europe and Asia."

V.—*A. serrirostris*, Swinh., ♂ ad., 28th June 1905, Alazeia riv., N. E. Siberia, No. 288, by Mr. K. F. Roznowski, in my collection,—*the smallest* adult male among much more than hundred shot by my expedition.

VI. - *A. serrirostris*, Swinh., ♀ ad., No. 1959, 5th June 1905, Kolyma's delta, by myself and in my collection, *the smallest* adult female shot.

VII.—*A. serrirostris*, Swinh., being *cotype* of *A. oatesi*, Rickett, sex (?) ad., November 1891,* Foochow, China, by Mr. C. C. B. Rickett, in the British Museum, measured by Mr. H. E. Dresser.

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* So recorded from the label; in original description given "January'

VIII.—*A. serrirostris*, Swinh., *typical* specimen,* ♂ ad., marked "d" in the Catal. Bird, Br. Mus., XVII., p. 103, December, Ningpo, China, by R. Swinhoe, in the British Museum, measured by Mr. H. E. Dresser.

IX.—*A. serrirostris*, Swinh., ♀ ad., No. 2083, 16th June 1905, in Kolyma's delta, by myself and in my collection; *a large* female.

X.—*A. serrirostris*, Swinh., ♂ ad., No. 2073, 15th June 1905, in Kolyma's delta, by myself and in my collection; *a large* gander.

XI.—*A. serrirostris*, Swinh., ♂ ad., marked "e" in the Catal. B. Br. Mus., l.c., October, Hakodadi, Japan, by Blakiston, in the British Museum, measured by Mr. H. E. Dresser.

XII.—*A. serrirostris*, Swinh., ♂ ad., No. 3309, 16th September 1905, in Kolyma's delta, by myself, in the Zoolog. Museum of University of Moskwa: *largest* specimen among much more than hundred procured.

XIII.—*A. sibiricus*, Alpher., ♀ ad., No. 3593, spring 1905, near Abyi, Indigirka Bassin, by Mr. T. Burnashov, in my collection: specimen *below average* size.

XIV.—? *A. mentalis*, Oates, ♂ ad., No. 2906, 16th July 1905, in Kolyma's delta, by Mr. J. A. Shulga, in my collection; *the only* specimen procured during my trip; pale preapical band of bill yellow, this colour extending far under nostrils.

All dates above are given in the "new style" uniformly.

Specimens.	Species of Bean-Geese.		Wing.	Tarsus.	Length of			Depth of		Length of Nail.
					Exposed culmen.	Commissure.	From fore end of nostrils.	Whole bill.	Lower mandible.	
I	brachyrhynchus ...		445	73	47·5	49	24	26·3	5·5	14
II	carneirostris		405	76·5	56	55·3	32·7	30·5	9	18
III	segetum		427	70	55·3	56·5	32	30	9	17
IV	do.		450	76	61	...	...	32	9·2	...
V	serrirostris		450	78	58	59·3	32	34	10	18·5
VI	do.		425	76·5	59	62·5	33·9	33·3	9·5	16
VII	do.	(cotype of "oatesi")	445	79	61·5	66	33·5	36	11	17·5
VIII	do.	(Swinhoe's spec.)	458	71·5	63	...	33	41	9	19
IX	do.		415	79	66	65	35·5	34	10	18·2
X	do.		472	90	67·7	68·3	38	35	10·8	20·5
XI	do.	(Hakodadi)	448	79·5	68	72	39	35·5	12	20
XII	do.		488	87·5	67	69	39	37	12	18·5
XIII	sibiricus		4[illegible]0	87	67·8	68·5	36	32	8·4	17
XIV	? mentalis		483	82	71·5	70·5	39·5	36·2	12	21·2

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* At least the *only* Swinhoe's specimen in the Br. Mus.

I may add, that in *A. sibiricus*, Alpher. number of "teeth" on one side of the upper mandible is 26, in all other specimens not more than 20. As to the general colouring of these specimens—*Ans. brachyrhynchus*, Baill., is at a glance distinguishable by its very pale general colouring, especially by lavender-grey secondary coverts. Among others *A. carneirostris*, Buturl., is conspicuous by its darker brownish head. All others are very much alike, showing only slight individual variation in shade of colouring. The specimen named "*oatesi*" indeed being quite identical in this respect with Swinhoe's specimen of "*serrirostris*" (H. E. Dresser in litt.).

A. oatesi was described twice: in Bull. Br. O. C. v. LXXVII, p. 46, by Mr. C. B. Rickett, and in v., XVII, No. 1, p. 49 of this Journal by Mr. E. W. Oates, who thought that it does not "require any further description."* In these descriptions it was stated that the bird is "similar in size and plumage to *A. brachyrhynchus*, but with a *much* larger bill" and Mr. Oates suggested that it is always separable from *A. segetum* by length of wing.

Now we see, that in size—length of wing excepted †—as in colouring this bird has nothing at all to do with *A. brachyrhynchus*, and, on the other hand, that such length of wing as 17·5 inch. (445mm.), or even 16·4 inch. (416 mm.) is of no use as distinguishing character, small though adult specimens of *A. carneirostris*, *A. segetum*, *A. serrirostris* having such wings. The bill of the bird, as Mr. Oates himself states, is very much like that of *A. segetum*, but longer and higher. In other words it is the bill of *A. serrirostris*, and in fact the bird is identical with Swinhoe's specimen.

It can be readily understood how this error, especially the strange comparison with *A. brachyrhynchus*, originated. *A. segetum* is exceedingly rare without the limits of Russia, and even here not common. Messrs. Oates and Rickett had evidently never seen this bird (Mr. Oates states this to be the case, p. 39, No. 1, v. XVII of this Journal) and imagined it to be of the same size as the common English *A. arvensis*, Brhm. (as Mr. Oates himself says, l. c. p. 43). Therefore having in hand a Chinese Bean-Goose of much smaller size than *A. arvensis* they stated it to be "like *A. brachyrhynchus*" disregarding peculiar colouring of this last.

Now I must state my reasons for identifying my Kolyma birds (and "A. oatesi") with *A. serrirostris* of Swinhoe. First of all, not only colouring of feathers, but all dimensions and size and shape of bill are the same in all these birds (length of nail more than ¼ of the length of exposed culmen; number of "teeth" on each side of upper mandible about 20; depth of bill more than 1, 3 inch; depth of lower mandible 0·35—0·47 inch). Further, Bean-Geese with characters just pointed out swarm not only on Kolyma, but in other parts of N. E. Siberia during breeding time, and they go to China for wintering, as proved by Chinese iron shot and Chinese hooks often met with in the flesh of these birds (cf. my paper in the *Field*, 1906, No. 2812, p. 861, replied by "Shanghai" in No. 2813, p. 909). Last, but not least, Swinhoe states that his *A. serrirostris* swarms in winter in China (Takoo, Peking, Foo-chow, Amoy, Canton), and as Mr. Oates justly remarks—it was evidently the only Bean-Goose known to Swinhoe. *A. oatesi* was procured at the same place where Swinhoe met his geese (Foo-chow).

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* Though size of the nail and depth of lower mandible were not stated (they are recorded for the first time in the present paper), and without these characters Bean-Geese are impossible to identify, as Mr. Oates must know as well, as anyone, for he was the first to point out the usefulness of one of these characters, some nine years ago.

† Length of wing, as is easy to see, is quite a useless character in these birds.

There is only one point that seems to disaccord with this view. All my Kolyma birds had pale band of the bill of a yellow colour. "*A. oatesi*—" as Mr. Rickett now recollects, according to Mr. Oates—has it also yellow. And type specimen of *A. serrirostris* is described by Swinhoe (*Ibis*, 1867, pp. 392-3) as having this part of bill "pinkish-red." When I suggested that this description was made not from quite fresh specimens, Mr. Oates replied that I "impute to Swinhoe a want of sagacity which would be deplorable in a child," and in his paper to the *Field* Mr. Oates adds that Swinhoe described the bill of "a recently killed gander" (*Field*, 1906, No. 2814, p. 948). There is no question of sagacity, but any how Mr. Oates is strangely mistaken, Swinhoe himself states in his "Jottings on Birds from my Amoy Journal" (*Ibis*, 1867, p. 392), when describing the bird afterwards named by him *A. serrirostris*; "A friend *sent* me a wild gander shot on the flats of the *Changchow River*" (italics are mine). A bird sent by post or otherwise from place to place may be "recently" killed enough for some practical use, and in many cases it will have its bill colouring unaltered, but as sometimes yellow colour of the bill is altered to pink as soon as an hour or two after the bird was shot, description of these colours must be made exactly on the spot, not at home after shooting and sending specimens. And if it is not expressly stated to be thus recorded a description of bill of a goose cannot be trusted as to the colouring.

I must add that Abbè David (David et Oustalot "Les Oiseaux de la Chine," 1878, p 491), who evidently knew "immense flocks" and "swarms" of Bean-Geese, described by Swinhoe, expressly states that they have "black and yellow bills."

Mr. Eugene W. Oates himself in his "Game Birds of India," II, 1899, p. 76, writes: "*Anser serrirostris* Gould......The legs and bill are coloured as in the common Bean-Goose of Europe" (*h. e.* yellow !).

I hope the following key will prove of some use for field observers. It must be kept in mind that females average considerably smaller than ganders, that birds of the year are also smaller and distinguishable by pale and black parts of the bill being not in such a sharp contrast as in old birds (and feathers of back narrower)

Key to Bean-Geese (*Melanonyx*).

I. Secondary coverts lavender-grey; exposed culmen plainly less than 1·95 in. long; maximum depth of lower mandible in closed bill 0·20—0·22 in., depth of the whole bill at the forehead feathering about 1 in.; legs and pale parts of bill pinkish-fleshy; (wing 15·7—17·5 in. long) ... ... *brachyrhynchus* Baill.

II. Secondary coverts dark greyish brown; exposed culmen plainly more than 1·95 in. long; depth of lower mandible in adult birds 0·23 in. and more; depth of bill 1·1 in. and more.

A. Length of nail of upper mandible as seen from above included in total length of exposed culmen from 4 to about 4½ times; depth of bill at the limit of forehead feathering generally less or else equal to half of length of exposed culmen; depth of lower mandible included in the length of exposed culmen about 10 to 7¾ times, rarely 7½ and quite exceptionally about 7 times; number of "teeth" on every side of upper mandible 25—30, rarely 24 or 23;

a. Depth of lower mandible 0·23—0·25 in. in adults, 0·22 in. in young ones; pale parts of bill and legs flesh-coloured or rosy-pink; culmen about 2·16—2·72 in. long; (wing 16·2—19·0 in. long) .... *neglectus* Sushkin.

b. lower mandible 0·27 in. and more deep in adults, not less than 0·23 in. in young ones; legs and pale parts of bill yellow or orange-yellow;

*a*¹. bill with yellow more or less prevailing over black in quite adult birds or—in young and some old ones—at any rate yellow colouring stretches back on sides of bill some way under the nostrils; depth of lower mandible 0·27—0·32 in., in young ones sometimes down to 0·23 in., in some big-billed old ones up to 0·36 in.; depth of bill 1·1—1·32 in.; exposed culmen 2·42—2·83 in.; along the base of upper mandible ordinarily (not always) a more or less distinct band of white feathers; (wing 16·10—19·60 in. long) ... *arvensis* Brhm.

*b*¹. bill with black greatly prevailing even in old birds, yellow forming a narrow band behind the nail, sometimes just reaching the fore end of, but never stretches back under the nostril; depth of lower mandible 0·33—0·45 in., rarely up to 0·47 in., in young ones down to 0·31 in.; depth of bill 1·26—1·5 in.: exposed culmen 2·63—3·27 in., in young ones sometimes down to 2·52 in.; along the base of upper mandible rarely if ever a trace of white bands; (wing 17·7—19·8 in. long) .... *sibiricus* Alph.

B. Length of nail of upper mandible as seen from above included in total length of exposed culmen clearly less than 4 times, usually about 3¼—3¾ times; depth of bill (both mandibles) opposite the limit of forehead feathering and culmen—somewhat more than half of length of exposed culmen: depth of lower mandible included in the length of exposed culmen about 5½—6½ times, very rarely 7 times; number of teeth on each side of upper mandible normally about 20—21, rarely up to 24 or 25.

c. Depth of bill opposite limit of feathering on culmen 1·1—1·28 in.; depth of lower mandible 0·33—0·37 in., in young ones sometimes down to 0·30 in. (in old ones said to attain exceptionally 0·43 in. but I doubt this); culmen 2·0—2·42 in. long.

*c*¹. Pale band of bill pinkish-red or flesh-coloured, though legs yellow; head darker brown; (wing 15·95—18·7 in. long) ...... *carneirostris* Buturl.

*d*¹. Pale band of bill, as legs, yellow or orange-yellow; head lighter coloured; (wing 16·12—17·75 in. long) .... *segetum* Gm.

d. Depth of bill 1·31—1·63 in.; depth of lower mandible 0·39 in. and more, rarely down to 0·37 and in young ones sometimes to 0·35 in.; exposed culmen commonly 2·44 in. long and more, rarely down to 2·28 in.

*e*¹. Pale colouring of the bill rarely if ever extending back under the nostrils, exposed culmen about 2·44—2·68 in., less commonly down to 2·28—or up to 2·84 in.

long ; depth of bill 1·31—1·41 in., rarely 1·46 in.; depth of lower mandible 0·39—0·47 in., less commonly down to 0·37 or in young ones to 0·35 in. and up to 0·49 in. ; wing 16·3—19·2 in. long (straight from corpal joint to end) .... *serrirostris* Swinh.

f^1. Pale colouring of the bill extends—at least in adults—far back under the nostrils ; exposed culmen about 2·82—2·95 in., sometimes down to 2·73 in. long : depth of bill 1·5—1·63 in., sometimes down to 1·42 in.; depth of lower mandible 0·51—0·61 in., sometimes 0·47 in.; (wing 19·48—19·60 in., sometimes down to 19·0 in. long) .... *mentalis* Oates.

Among these birds *Anser* (or more precisely *Melanonyx*) *brachyrhynchus*, *A. neglectus*, *A. arvensis* and *A. segetum* are perfectly "good" species, but *A. sibiricus* is only an eastern sub-species of *A. arvensis*, and *A. carneirostris*, *A. serrirostris* and *A. mentalis* are geographical forms or sub-species of *A. segetum*.

THE FLORA OF THE BOMBAY PRESIDENCY.

(STATISTICO-BIOLOGICAL NOTES.)

BY

E. BLATTER, S. J.

(With Plate A.)

In the first volume of the Imperial Gazetteer of India, J. D. Hooker gives a short sketch of the Flora of British India. He divides the whole area into nine botanical regions which are determined by the number of species of the ten largest Natural Orders in each region. As I shall very often, in the following, compare the Flora of Bombay with the vegetation of other areas, I consider it necessary to acquaint the reader with Hooker's botanical divisions. The nine regions are—

1. The Eastern Himalayas, extending from Sikkim to the Mishmi mountains in Upper Assam.
2. The Western Himalayas, extending from Kumaun to Chitral.
3. The Indus Plain, including the Punjab, Sind, and Rajputana, west of the Aravalli range and Jumna river, Cutch, and Northern Gujarat.
4. The Gangetic Plain, from the Aravalli hills and Jumna river to Bengal, the Sundarbans, the plains of Assam and Sylhet, and the low country of Orissa north of the Mahanadi river.
5. Malabar in a very extended sense—the humid belt of hilly or mountainous country extending along the western side of the Peninsula from Southern Gujarat, the southern half of Kathiawar, the Konkan, Kanara, Malabar proper, Cochin, Travancore, and the Laccadive Islands.
6. The Deccan in a broad sense: that is, the whole comparatively dry elevated table-land of the Peninsula east of Malabar and south of the Gangetic and Indus Plains, together with, as a sub-region, the low-lying strip of coast land extending from Orissa to Tinnevelly, known as the Coromandel Coast.
7. Ceylon and the Maldive Islands.
8. Burma, bounded on the N. and N.-E. by the flanking mountains to the south of the Assam valley and China, on the east by China and Siam, on the west by Bengal and the Indian Ocean, and on the south by the State of Khedah in the Malay Peninsula.

9. The Malay Peninsula, from Khedah to Singapore, including the British Protected States in this Peninsula. The British Provinces proper are Wellesley, the Island of Penang, Malacca, and Singapore.[1]

A glance at the map of India shows at once that the Bombay Presidency belongs to three of these botanical regions: Sind, Cutch, Northern Gujarat to the Indus Plain region, Khandesh, the Konkan, and Kanara to the Malabar region, and the rest to the Deccan region. We should, accordingly, expect the Bombay Flora to be a very rich one, the more so, because the geographical and climatic features of the Presidency show a great variety. But, notwithstanding the extent of the Bombay Presidency, its diversified surface, and its variations in climate and soil, it is impossible to characterise its flora as a rich one, I am even tempted to call it poor. The total number of species of indigenous flowering plants is about 2,530.[2] It is estimated that the Eastern Himalayan region contains about 4,000 species, the Western Himalayan about the same number; the Ceylon region, which is very small compared with the Bombay Presidency, contains 2,800 species, the Burmese 4,500, and the Malayan about 6,000.

The 2,530 species of our Presidency are comprised in 142 Orders[3] no doubt, a great number, if we consider that the whole Flora of British India, approaching 17,000 species, belongs to 176 Orders. But we must not forget that 42 out of 142 Orders contain one genus only, and 22 Orders not more than two. Of the former 20 Orders contain only one species: *Magnoliaceæ*, *Papaveraceæ*, *Fumariaceæ*,

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[1] Taken from the Imperial Gazetteer of India, Vol. I, p. 168.

[2] This and other numbers regarding the Bombay Flora have been gathered from the following sources:—

Cooke, Flora of the Presidency of Bombay, Vol. I, Vol. II, Part 1, 2, 3.

W. A. Talbot, Systematic List of the Trees, Shrubs, and Woody Climbers of the Bombay Presidency.

G. M. Woodrow, Catalogue of the Flora of Western India (In the Journal of the Bombay Natural History Society, Vols. XI, XII, XIII).

J. D. Hooker, Flora of British India, Vols. I—VII.

Besides, the Herbaria of the Bombay Natural History Society, of St. Xavier's College, and of the Science College in Poona have been consulted.

I follow, for practical reasons, the system of Bentham and Hooker, proposed in their Genera Plantarum, which has remained the standard one in Britain, though on the Continent it has long been superseded by the more natural system exposed by Engler in "Die Natürlichen Pflanzenfamilien."

Ancistrocladaceæ, Chailletiaceæ, Ilicaceæ, Sabiaceæ, Saxifragaceæ, Haloragidaceæ, Passifloraceæ, Datiscaceæ, Araliaceæ, Hydrophyllaceæ, Illecebraceæ, Thymelæaceæ, Elæagnaceæ, Balanophoraceæ, Ceratophyllaceæ, Xyridaceæ, Flagellariaceæ.

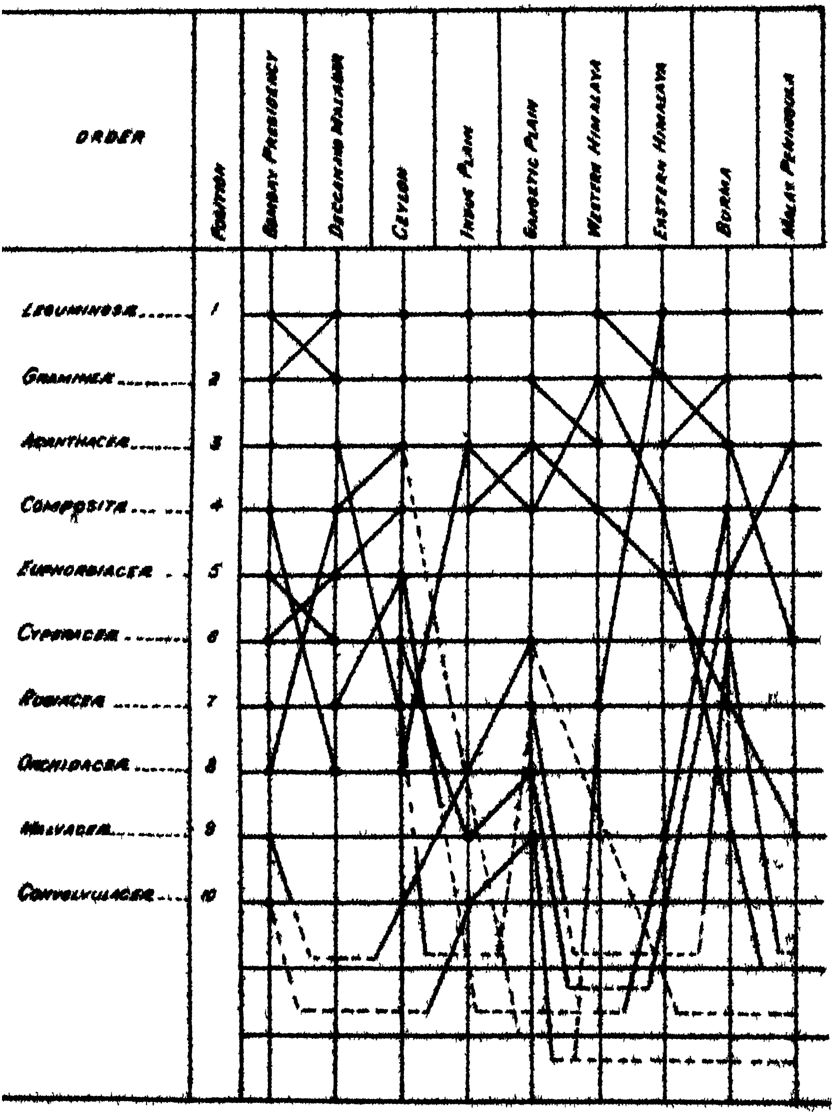
The dominant Orders are the following :—

Order.	Species.	Percentage of total.	Order.	Species.	Percentage of total.
Leguminosæ	284	11·2	Convolvulaceæ ...	63	2·5
Gramineæ	248	9·5	Labiatæ	57	2·2
Acanthaceæ	109	4·3	Asclepiadaceæ ...	51	2·0
Compositæ	104	4·1	Scrophulariaceæ ...	51	2·0
Euphorbiaceæ ...	100	3·9	Urticaceæ	43	1·7
Cyperaceæ	99	3·9	Tiliaceæ	34	1·3
Rubiaceæ	80	3·1	Boraginaceæ	33	1·3
Orchidaceæ	72	2·8	Commelinaceæ ...	33	1·3
Malvaceæ	67	2·6			

The first eleven Orders make up just one-half of the flora, whereas the other half is comprised in 131 Orders.

For the purpose of getting a clearer insight into the relations of our flora to those of other parts of India, I shall add a list of the 10 dominant orders of the different botanical regions (CF. HOOKER) :

Bombay Presidency.	Deccan and Malabar Region.	Ceylon Region.
Leguminosæ.	Gramineæ.	Gramineæ.
Gramineæ.	Leguminosæ.	Leguminosæ.
Acanthaceæ.	Acanthaceæ.	Orchidaceæ
Compositæ.	Orchidaceæ.	Cyperaceæ.
Euphorbiaceæ.	Cyperaceæ.	Rubiaceæ.
Cyperaceæ.	Euphorbiaceæ.	Euphorbiaceæ.
Rubiaceæ.	Rubiaceæ.	Acanthaceæ.
Orchidaceæ.	Compositæ.	Compositæ.
Malvaceæ.	Labiatæ.	Urticaceæ.
Convolvulaceæ.	Asclepiadaceæ.	Melastomaceæ.



DISTRIBUTION OF THE 10 DOMINANT ORDERS,
OF THE BOMBAY PRESIDENCY IN THE VARIOUS

Indus-Plain Region.	Gangetic Plain Region.	Western Himalayan Region.
Gramineæ.	Gramineæ.	Gramineæ.
Leguminosæ.	Leguminosæ.	Compositæ.
Compositæ.	Cyperaceæ.	Leguminosæ.
Cyperaceæ.	Compositæ.	Cyperaceæ.
Scrophulariaceæ.	Scrophulariaceæ.	Labiatæ.
Labiatæ.	Malvaceæ.	Ranunculaceæ.
Boraginaceæ.	Acanthaceæ.	Orchidaceæ.
Malvaceæ.	Euphorbiaceæ.	Cruciferæ.
Euphorbiaceæ.	Convolvulaceæ.	Rosaceæ.
Convolvulaceæ.	Labiatæ.	Scrophulariaceæ.

Eastern Himalayan Region.	Burmese Region.	Malayan Peninsula Region
Orchidaceæ.	Orchidaceæ.	Orchidaceæ.
Gramineæ.	Leguminosæ.	Leguminosæ.
Leguminosæ.	Gramineæ.	Euphorbiaceæ.
Compositæ.	Rubiaceæ.	Rubiaceæ.
Cyperaceæ.	Euphorbiaceæ.	Anonaceæ.
Urticaceæ.	Acanthaceæ.	Gramineæ.
Scrophulariaceæ.	Cyperaceæ.	Scitaminaceæ.
Rosaceæ.	Urticaceæ.	Melastomaceæ.
Rubiaceæ.	Compositæ.	Cyperaceæ.
Euphorbiaceæ.	Scitaminaceæ.	Urticaceæ.

Plate A gives the same relations graphically. It shows only the relative position of the ten dominant orders of the Bombay Presidency in the different botanical regions of British India, *e. g.*, the *Leguminosæ* take the first place in the Bombay Presidency, and the third in the Eastern and Western Himalaya; the *Orchidaceæ* occupy the 8th position in the Bombay Presidency, but are not to be found amongst the 10 dominant orders of the Indus and Gangetic Plain regions, etc. A dotted line indicates that the given dominant order of Bombay is not amongst the 10 dominant orders of the respective region.

The proportion of *Monocotyledons* to *Dicotyledons* is 1 : 3·2, whereas the whole Indian Flora shows the proportion 1 : 2·3. The *Dicotyledons* comprise 115 orders with 773 genera and 1,934 species; the *Monocotyledons* 26 orders with 195 genera and 594 species, and the *Gymnospermæ* only 1 order with 2 genera and 2 species.

More striking still is the proportion of genera to species. In the whole of British India it is 1: 7, and in the Bombay Presidency 1 : 2·6. This difference is due to the fact that of the 970 genera of the Bombay Flora there are not less than 592 genera with only one species. On the whole, the various genera are poorly represented with regard to the number of their species. There are only 10 genera with more than 20 species, and the number does not rise higher than 35. The dominant genera are the following (to which are appended, in brackets, the number of species) :—*Andropogon* (35), *Crotalaria* (32), *Panicum* (30), *Cyperus* (28), *Indigofera* (27), *Habenaria* (24), *Hibiscus* (23), *Vitis* (22), *Ipomœa* (21), *Euphorbia* (21), *Ficus* (18), *Grewia* (17), *Impatiens* (16), *Cassia* (16), *Acacia* (16), *Leucas* (16).

A comparison of the orders with regard to the number of genera gives us the following list:—*Leguminosæ* (82 genera), *Gramineæ* (74), *Compositæ* (52), *Euphorbiaceæ* (37), *Acanthaceæ* (36), *Rubiaceæ* (34), *Scrophulariaceæ* (26), *Orchidaceæ* (26), *Asclepiadaceæ* (25), *Labiatæ* (21), *Convolvulaceæ* (18), *Urticaceæ* (18), *Apocynaceæ*(17), *Cyperaceæ* (17), *Malvaceæ* (16), *Rutaceæ* (16), *Meliaceæ* (16).

Of the natural orders and genera not one is peculiar to the Bombay Presidency, and the endemic species are comparatively very few. The following[1] seem to be endemic, though I feel not quite sure about each and every one, the floristic literature of the Western India libraries being exceedingly poor :—*Flacourtia latifolia*, *F. montana*, *Abutilon ranadei*, Woodr., *A. cornutum*, *Pavonia ceratocarpa*, *Gossypium stocksii*, *Impatiens stocksii*, *I. dalzellii*, *I. pulcherrima*, *Crotalaria prostrata*, *Indigofera Dalzellii*, *Smithia purpurea*, *Spatholobus purpureus*, *Canavalia stocksii*, *Dolichos bracteatus*, *Flemingia tuberosa*, *Ammannia floribunda*, *Dicœlospermum ritchiei*, *Peucedanum grande*, *Diplospora apiocarpa*, *D. sphœrocarpa*, *Psychotria flavida*, *P. canarensis*, *P. octosulcata*, *Cyathocline lutea*, *Blumea belangeriana*, *B. malcolmii*, *Nanothamnus sericeus*, *Senecio dalzellii*, *Jasminum flexile*, *Ellertonia rheedei*, *Ervatamia heyneana*, *Beaumontia jerdoniana*, *Sarcostemma stocksii*, *Hoya retusa*, *Oianthus urceolatus*, *Frerea indica*, *Canscora concanensis*, *Paracaryum malabaricum*, *P. lambertinum*, *Sericostoma pauciflorum*, *Utricularia albo-cœrulea*, *U. arcuata*, *Blepharis asperrima*, *Strobilanthes sessilis*, *var ritchiei*, *S. heyneanus*,

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[1] The nomenclature here adopted is that laid down in Hooker's Flora of British India.

S. scrobiculatus, *S. warreensis*, *S. perfoliatus*, *S. læiocephalus*, *Calacanthus dalzelliana*, *Neuracanthus sphærostachyus*, *Asystasia violacea*, *A. lawiana*, *Nepeta bombaiensis*, *Litsea stocksii*, *L. wightiana*, *Loranthus wallichianus*, *L. obtusatus*, *L. stocksii*, *L. elasticus*, *L. lageniferus*, *L. trigonus*, *Phyllanthus scabrifolius*, *Glochidion ellipticum*, *Cyclostemon confertiflorus*, *Jatropha nana*, *Adenochlæna indica*, *Trewia polycarpa*, *Mallotus stenanthus*, *Mallotus lawii*, *Homonoia retusa*, *Habenaria suaveolens*, *H. flavescens*, *Curcuma decipiens*, *Kæmpferia scaposa*, *Hedychium coronarium*, *Amomum microstephanum*, *Zingiber nimmonii*, *Z. cernuum*, *Z. macrostachyum*, *Musa superba*, *Crinum brachynema*, *C. woodrowii*, *Pancratium parvum*, *Dioscorea jacquemontii*, *Asparagus dumosus*, *A. jacquemontii*, *Chlorophytum glaucum*, *Dipcadi minor*, *D. concanense*, *D. unicolor*, *Iphigenia pallida*, *Aneilema versicolor*, *Cyanotis vivipara*, *Arisæma caudatum*, *Typhonium bulbiferum*, *Theriphonum dalzellii*, *Amorphophallus commutatus*, *Eriocaulon odoratum*, *E. lanceolatum*, *E. stellulatum (?)*, *E. dalzellii*, *E. cuspidatum*, *Fimbristylis digitata*, *Sileria stocksiana*, *Isachne lisboæ*, *I. elegans*, *Arundinella pygmea*, *A. gigantea*, *Polytoca cookii*, *Dimeria woodrowii*, *Ischæmum diplopogon*, *I. lisboæ*, *I. spathiflorum*, *Arthraxon inermis*, *A. jubatus*, *Rottbœllia divergens*, *R. talboti*, *Andropogon compressus*, *A. woodrowii*, *A. concanensis*, *A. ensiformis*, *A. odoratus*, *A. armatus*, *Woodrowia diandra*, *Tripogon pauperculus*.

The Flora of the Bombay Presidency, therefore, contains only 127 endemic species, of which 55 are *Monocotyledons* and 72 *Dicotyledons*. It is more than probable that some of these will be found not to be endemic when the vegetation of Africa and the Malay Peninsula, and especially that of the neighbouring territories, will have been explored in greater detail.

With regard to its biology, the Flora of the Presidency is characterised by the preponderance of perennial plants as compared with the annual and biennial ones. Out of 2,300[1] species 1,700 are perennial and 600 annual, the latter including a small number of biennials. Hence, roughly speaking, the perennials make up ¾ of the whole flora. Of these 430 are trees, 520 shrubs, 160 undershrubs, and 590 herbs.

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[1] With regard to a good many species it is not ascertained as yet whether they are annual or perennial.

It is evident that a sharp demarcation between trees and shrubs cannot be made, as all kinds of intermediate forms exist. Similarly, between shrubs, undershrubs, and herbs there occur many intermediate forms, and the above numbers will, therefore, always be slightly modified according to the observer's opinion.

In our perennial herbs, which live for several or many years and usually flower every year, the vegetative period is generally interrupted by the dry season, the aërial parts of the plant as a rule dying down. A storage of reserves enables the plant to recommence its growth upon the return of the rainy season and very often already towards the end of the dry season. This storage is usually made below ground where it is well protected, but may also be in the leaves. The part in which storage is contained is more or less swollen, and if it includes a bud, it is nearly always made to subserve the process of vegetative reproduction. In many of our perennials the original plant does not re-appear in the second season, but in its place arise a number of new plants formed from it by vegetative methods.

We have first the case of plants which store reserves in underground creeping stems or rhizomes, which are usually thickened and have their leaves reduced to scales. The flora of the Presidency furnishes many examples belonging to the *Begoniaceæ*, *Convolvulaceæ*, *Zingiberaceæ*, *Musaceæ*, *Amaryllidaceæ*. Rhizomes often branch extensively, and as the older parts decay the branches are set free, and thus vegetative multiplication is brought about, *e.g.*, in *Musa*, *Dioscoreæ*, *Cyperaceæ*. In other cases the rhizome instead of creeping horizontally stands more or less erect and resembles a tuber ; in such cases it is usually termed a root-stock as, *e.g.*, in *Phrynum* (*Maranteæ*) *Hypoxis* and *Curculigo* (*Amaryllidaceæ*), and in *Taccaceæ*. *Crinum* and *Pancratium* have got a bulbous root-stock and some *Liliaceæ* a tuberous one. Creeping root-stocks are very common in our species of *Asparagus*, in the *Pontederiaceæ*, *Aroidaceæ*, and *Naiadaceæ*.

Another type of shoot, the corm, is seen in *Iphigenia*, where the lower part of the stem is swollen out into a more or less spherical shape to contain reserve materials. Tubers, which may be of stem or root nature, are found in some of the *Liliaceæ*, *Commelinaceæ*, *Aroidaceæ*, *Convolvulaceæ*, and especially in *Dioscoriaceæ*, where the tubers show different morphological nature in different species. Our

Orchidaceæ are either terrestrial tuberous-rooted herbs with an annual herbaceous stem, or they are epiphytes with perennial stems or branches which, sometimes, get variously thickened and form pseudo-bulbs. Each year one pseudo-bulb is usually formed. It contains water and other reserve material and enables those plants that drop their leaves during the dry season to hibernate till new assimilating organs are formed. The *Crassulaceæ* have fleshy leaves closely packed together which serve the same end.

The phanerogamic water-plants are poorly represented in our Flora. If we make a distinction between floating plants that spread their leaves on the surface of the water and submerged plants that raise only the flowers above the surface, we find the following species belonging to the first class : *Nymphæa lotus*, *N. stellata*, *Nasturtium officinale*, *Neptunia oleracea*, *Limnanthemum indicum*, *L. cristatum*, *L. parvifolium*, *L. aurantiacum*, *Limnophila polystachya*, *Utricularia stellaris*, *U. exoleta*, *Pistia stratiotes*, *Lemna gibba*, *L. polyrrhiza*, *Wolffia arrhiza*, *Sagittaria sagittifolia*, *Wisneria triandra*, *Cyperus cephalotus*, *Chamæraphis spinescens*, *Hygrorhiza aristata*. Of submerged flowering plants the following are known : *Ceratophyllum demersum*, *Myriophyllum intermedium*, *Limnophila racemosa*, *Utricularia flexuosa*, *U. cærulea*, *Lawia zeylanica*, *Griffithelia hookeriana*, *Hydrobryum lichenoides*, *Hydrilla verticillata*, *Lagarosiphon roxburghii*, *Vallisneria spiralis*, *Blyxa roxburghii*, *B. echinosperma*, *B. talboti*, *Ottelia alismoides*, *Aponogeton monostachyum*, *Potamogeton indicum*, *P. perfoliatus*, *P. crispus*, *P. pectinatus*, *Ruppia rostellata*, *Zannichellia palustris*, *Naias minor*, *Eriocaulon capillus-naiadis*.

Of marsh-plants (*i.e.*, plants which grow exclusively in real marshes, in stagnant or slowly flowing waters, where they are rooting in the mud, but raise their vegetative and reproductive parts above the water) I shall mention only the most common ones : *Nelumbium speciosum*, *Jussiæa repens*, *J. suffruticosa*, *Ludwigia parviflora*, *Ipomæa aquatica*, *Limnophila roxburghii*, *L. conferta*, *L. gratissima*, *L. sessiflora*, *L. gratioloides*, *Typha elephantina*, *T. angustata*, *Cryptocaryne retrospiralis*, *C. spiralis*, *C. cognata*, *C. roxburghii*, *C. dalzellii*, *Lagenandra toxicaria*, *Alisma reniforme*, *Limnophyton obtusifolium*, *Butomopsis lanceolata*, *Eriocaulon odoratum*, *E. breviscarpum*, *E. wightianum*, *Heleochloa dura*, *Adenostemma viscosa*, *Cyathocline lutea*, *Cæsulia axillaris*, *Sphenoclea zeylanica*, *Dopatrium junceum*, *Ilysanthes hyssopioides*, *I. parviflora*, *I. minima*, *I. rotundifolia*, *Hygrophila spinosa.*

The climbing plants are well represented in our Flora, nearly ⅐ of all the plants being climbers. 214 species are woody, and 186 herbaceous. This biologically very peculiar group includes plants of 43 different Orders. The *Menispermaceæ*, *Ancistrocladaceæ*, *Malpighiaceæ*, *Cucurbitaceæ*, *Gnetaceæ*, *Dioscoreaceæ* have only climbers as representatives in the Bombay Flora. The Orders which contain the greatest number of climbing plants are: *Leguminosæ* (with 68 species), *Convolvulaceæ* (46), *Asclepiadaceæ* (40), *Cucurbitaceæ* (31), *Vitaceæ* (22), *Menispermaceæ* (11), *Apocynaceæ* (9), *Celastraceæ* (8), *Oleaceæ* (8).

Of parasites, *i.e.*, plants which draw the whole or part of their food materials from other plants by means of haustoria, the Bombay Flora contains 40 species. Only 10 species are total parasites that take all their nourishment from the host: *Æginetia indica*, *Christisonia lawii*, *C. calcarata*, *Cistanche tubulosa*, *Orobanche cernua var. desertorum*, *O. ægyptiaca*, *Cassytha filiformis*, *Cuscuta reflexa*, *C. hyalina*, *C. chinensis*, *Balanophora indica.* The rest show all partial parasitism: *Striga orobanchioides*, *Loranthus wallichianus*, *L. obtusatus*, *L. scurrula*, *L. stocksii*, *L. gibbosus*, *L. elasticus*, *L. cuneatus*, *L. longiflorus*, *L. trigonus*, *L. lageniferus*, *L. capitellatus*, *L. loniceroides*, *Viscum monoicum*, *V. orientale*, *V. capitellatum*, *V. angulatum*, *V. articulatum*, *Santalum album.*

As to epiphytic plants (which grow clinging to other plants for support, but are not parasitic upon them, and are not usually attached to the soil) our Flora cannot be called rich. In no part of the Presidency do they impart a characteristic feature to the vegetation. Except *Æschynanthus perotteti*, *Argostemma verticillatum*, *Hoya retusa*, *Hoya wightii*, *Fagræa obovata*, *Peperomia wightiana*, *Ficus rumphii*, *Pothos scandens*, *Cyanotis vivipara*, and perhaps a few others, all belong to the *Orchidaceæ*: *Oberonia falconeri*, *O. retusa*, *O. platycaulon*, *Microstylis rheedii*, *Liparis dalzellii*, *Dendrobium macraei*, *D. microbulbon*, *D. chlorops*, *D. barbatulum*, *D. herbaceum*, *D. macrostachyum*, *D. crepidatum*, *D. mabelæ*, *Bulbophyllum neilgherrense*, *Cirrhopetalum fimbriatum*, *Trias stocksii*, *Eria reticulata*, *E. lichenora*, *E. reticosa*, *E. dalzellii*, *E. mysorensis*, *Phajus albus*, *P. microchilos*, *Josephia lanceolata*, *Cymbidium bicolor*, *Luisia tereti-*

folia, *L. tenuifolia*, *Cottonia macrostachya*, *Rhynchostylis retusa*, *Ærides maculosum*, *A. crispum*, *A. radicosum*, *A. odoratum*, *Vanda parviflora*, *V. roxburghii*, *Saccolabium maculatum.*

Of saprophytic plants, which grow upon decaying organic matter and absorb the products of decay, only two species are known to me belonging to the Order *Burmanniaceæ* : *Burmannia cœlestis* and *Burmannia pusilla.*

The class of insectivorous plants which obtain more or less nourishment from the dead bodies of small animals captured by means of a special apparatus, has also a few representatives in the Bombay Flora. *Drosera burmanni* and *D. indica* have glandular hairs secreting a sticky fluid to which insects, mistaking it for honey, adhere. The greater part of the animal substance is dissolved by means of a digestive fluid secreted by the plant. To the other group, the so-called "eel-trap" plants, which are furnished with bladder-like appendages for the capture and digestion of small insects, the following species belong: *Utricularia stellaris*, *U. flexuosa*, *U. exoleta*, *U. albo-cœrulea*, *U. arcuata*, *U. affinis*, *U. cœrulea*, *U. reticulata*, *U. nivea*, *U. striatula.*

These are a few statistical notes which are intended to convey a more distinct idea of the Flora of the Bombay Presidency than the mere enumeration and description of the different plants are apt to give. The completion of Cooke's Flora and further discoveries of new species will slightly modify the numbers as given above, but they will not change the main features which they express.

THE MOTHS OF INDIA.

SUPPLEMENTARY PAPER TO THE VOLUMES IN "THE FAUNA OF BRITISH INDIA." SERIES III, PART XI.

By

SIR GEORGE HAMPSON, BART., F.Z.S., F.E.S.

(*Continued from page* 271 *of this Volume.*)

PYRALIDÆ.

GALLERIANÆ.

HYDROCAMPINÆ.

p. 190. Genus. *Mixophila* insert GARGELA, Wlk., xxix, p. 815 (1864), which has precedence.

4631. *Mixophila* RENATUSALIS insert (syn.) GARGELA *subpurella*, Wlk., xxix, p. 815 (1864).

4633*b*. ERISTENA OLIGOSTIGMALIS, Hmpsn., A. M. N. H. (7), xviii, p. 389 (1906).

Hind femora of male short with fringe of long hair behind; hindwing with the termen excised at discal fold, then lobed.

Head, thorax and abdomen yellow mixed with white; palpi blackish at tips; fore femora and tibiæ above blackish; the fringe of hair on hind femora of male black and whitish. Forewing orange; a white fascia below the cell extending just into its lower part and at base to vein 1, at extremity expanding to the postmedial band and to above inner margin near tornus; a black spot on costa above end of cell; a slightly incurved white band from costa beyond middle to above tornus slightly defined on inner side by fuscous except towards costa; a white subterminal band defined by a fuscous line on inner side and a fine black line on outer, meeting the postmedial band above tornus; a fine black terminal line expanding into a spot at apex; cilia brownish white. Hindwing orange; an oblique white medial band from just beyond end of cell to just above middle of inner margin, defined by blackish lines on each side; a fine black terminal line interrupted by three small black spots between veins 5 and 2, the uppermost spot with a small white spot on inner side, the line very fine and double towards apex with a small white lunule on its inner side at apex; cilia white with a fuscous line near base from vein 5 to tornus.

Habitat.—ANDAMANS. *Exp.* 20 mill.

4645*b*. NYMPHULA LITANALIS, Wlk., xviii, 706 (1859).

Eudotricha stenialis, Warr., A. M. N. H. (6), viii, p. 68 (1891).

Head, thorax and abdomen ochreous yellow mixed with fuscous; antennæ yellow ringed with black, forewing yellow suffused and irrorated with fuscous leaving the costa and termen yellower; some black striæ from basal part of costa; an indistinct antemedial line defined by yellowish on inner side, incurved below median nervure; a yellow discoidal lunule; four semicircular yellow spots defined by black on terminal half of costa; a fine yellow subterminal line slightly defined by fuscous on outer side, angled outwards below costa then curved; a fine black terminal line; cilia whitish with black line near base and black tips. Hindwing fulvous yellow suffused and irrorated with fuscous; traces of a yellowish antemedial line and of a sinuous postmedial line; a fine black terminal line; cilia whitish with black line near base and fuscous line near tips. Underside of forewing with minutely waved subterminal line curved from costa to vein 3, then strongly incurved; hindwing with whitish discoidal lunule and sinuous whitish postmedial line.

Habitat.—ASSAM, Khasis; BORNEO, Sarawak. *Exp.* 20 mill.

4658*a*. *Ambia cyanealis* insert AMBIA CÆRULEATA, Hmpsn., Ill. Het. B. M., ix, p. 179, pl. 174, p. 29 (1893), which has priority.

4670. *a*. OLIGOSTIGMA MELANOTALIS, A. M. N. H. (7), xviii, p. 463 (1906).

Head, thorax and abdomen whitish mixed with orange; fore femora and tibiæ tinged with fuscous. Forewing whitish suffused with orange especially on costal and terminal areas, a black spot on middle of costa with traces of an oblique orange line from it towards inner margin; a rounded orange discoidal spot; a sinuous whitish postmedial line slightly defined by orange on inner side, followed by an orange band with fine black line on its outer edge, then an orange terminal band; a terminal series of slight black points; cilia whitish tinged with yellow. Hindwing with the basal area whitish; a blackish medial line not reaching costa or inner margin, the terminal half orange; a subterminal whitish band between veins 5 and 1 defined on inner side by a sinuous fuscous line and on outer by a blackish line; a fine fuscous terminal line with three small black spots at middle; cilia white with a fine fuscous line through them.

Habitat.—CEYLON, Maskeliya, Pundaloya. *Exp.* 18-20 mill.

4673*a*. OLIGOSTIGMA ALICIALIS, Hmpsn., A. M. N. H. (7), xviii, p. 463 (1906). (Plate E., f. 15.)

♀. Head and thorax pale brown; abdomen brown mixed with black and banded with white, the ventral surface white. Forewing pale brown suffused in parts with blackish; an oblique orange wedge-shaped patch beyond the cell from vein 7 to 2 defined on each side by fuscous lines; a curved white subterminal band bent inwards above inner margin, defined on inner side by blackish suffusion from costa to apex of the wedge-shaped patch and on outer by a black line followed by an orange terminal band; a fine black terminal line; cilia whitish with a fuscous line through them. Hindwing with the base black followed by a broad white band, then a broad black band, then a white band expanding somewhat at middle and defined on outer side by a fuscous line; a terminal orange band and fine black terminal line; cilia grey with black spots divided by fine white streaks at the medial lobe.

Habitat.—CEYLON, Udagama. *Exp.* 14 mill.

4681*a*. OLIGOSTIGMA AUROPUNCTALIS, Hmpsn., A. M. N. H. (7), xviii, p. 466 (1906).

White; abdomen tinged with ochreous towards extremity. Forewing slightly irrorated with brown; a medial yellow patch on inner area; a medial black point on costa with fuscous line from it to inner margin where it meets an oblique postmedial line; a fuscous-edged orange discoidal lunule; a subterminal rather wedge-shaped orange band hardly reaching inner margin; a terminal orange band with black line on its inner edge; a series of black points on termen and apical spot. Hindwing with oblique antemedial brownish band; the terminal area orange with curved black line on its inner edge and two fine terminal lines interrupted at middle by two black points on the lobe.

Habitat.—BHUTAN: MADRAS, Palni Hills, Kodikanal. *Exp.* 18 mill.

Subsp. 1. Forewing with the postmedial line straighter: hindwing with the sub-basal band yellow with black line on outer edge. *Habitat.*—JAVA, Arjuno.

4681*b*. OLIGOSTIGMA ALBIFURCALIS, Hmpsn., A. M. N. H. (7), xviii, p. 466 (1906).

♂. Head, thorax and abdomen orange; palpi with fuscous patch on 2nd joint above; base of proboscis and frons fuscous: abdomen whitish below. Forewing orange; the base of costa irrorated with fuscous; a whitish fascia irrorated with fuscous in and below cell, a black spot with some whitish on inner side on costa above end of cell; an incurved fuscous line with white band on its outer side from below costa beyond middle to above inner margin near tornus where it is met by an obliquely curved fuscous line from lower angle of cell forming a triangular mark filled in with whitish irrorated with fuscous: a curved white subterminal band defined by a fuscous line on inner side and a fine black line on outer side meeting the postmedial band above tornus; a fine black terminal line expanding into a black spot at apex; cilia brownish white with a fuscous line near base. Hindwing orange; an obliquely curved white medial band defined on each side by fuscous lines from just below costa to above inner margin; a fine black line just before termen slightly incurved at submedian fold; a black terminal line interrupted by three small lunulate black spots between veins 5 and 2; a little brownish white inside the subterminal line at apex; cilia brownish white with a slight fuscous line near base. Underside of forewing suffused with fuscous except terminal area.

Habitat.—ASSAM, Khasis. *Exp.* 22 mill.

Sect. II.—(*Cometura*). Abdomen of male with the anal segment short.

4708*a*. TATOBOTYS BIANNULALIS, Wlk, xxxiv, 1439 (1865).

Cometura picrogramma, Meyr. Trans. Ent. Soc., 1886, p. 226.

Hedylepta gemella, Moore, Lep. Atk., p. 208 (1888).

Orange-yellow; palpi whitish at base, fuscous at tips; thorax tinged with fuscous; abdomen with the ventral surface whitish. Forewing with the costal and terminal areas tinged with fuscous; a small black spot at middle of cell and oblique bar on each side of discocellulars; postmedial line minutely dentate, excurved from costa to vein 2, then retracted to below angle of cell; a black terminal line; cilia with a fuscous line through them. Hindwing with small fuscous discoidal annulus; postmedial line minutely dentate, excurved between veins 6 and 2; a black terminal line and black line through the cilia.

Habitat.—CEYLON; BURMA, Rangoon; BORNEO; SULA, NEW HEBRIDES, FIJI. *Exp.* 20 mill.

4720*a*. LUMA FLAVIMARGINALIS, Hmpsn., A. M. N. H. (7), xix, p. 2 (1906).

Head and thorax orange-yellow; palpi with the 2nd joint black above; abdomen fuscous, the extremity and ventral surface yellow. Forewing fuscous brown with a purplish gloss; the base orange-yellow; an orange-yellow terminal band expanding widely to costa, the outer edge of brown area being strongly curved. Hindwing fuscous brown with a slight purplish gloss; an orange-yellow terminal band expanding slightly to costa.

Habitat.—CEYLON, Maskelıya. *Exp.* ♂ 28, ♀ 36 mill.

4744. *Piletocera cotingens* insert Piletocera chrysorycta, Meyr. Trans. Ent. Soc. 1884, p. 320, which has priority.

Habitat.—JAPAN: W. CHINA; SIKHIM; ASSAM; CEYLON; BURMA; BORNEO; NEW GUINEA, St. Aiguan; QUEENSLAND; NEW SOUTH WALES.

p. 238. The genus CAMPTOMASTYX was described by Warren, A. M. N. H., (6), ix, p. 439 (1892).

SCOPARIANÆ.

4752*b*. MICRAGLOSSA DISTICTALIS, n. sp.

♀. Head and thorax grey-white slightly mixed with cupreous brown; palpi with black band on each joint; antennæ brown slightly mixed with white; tarsi banded black and white; abdomen white dorsally suffused with fuscous. Forewing white slightly irrorated with brown; subbasal blackish spots below costa and cell followed by a faint diffused erect line; a narrow erect antemedial black-brown band; a small round black-brown spot in middle of cell with another below it in submedian fold; reniform defined by brown, rather quadrate and concave on inner side, with black striga in centre and brown mark above it on costa; postmedial line brown, excurved from costa to vein 5, then obliquely incurved and with brown spot at inner margin, a wedge-shaped brown patch beyond it from costa to discal fold and another from vein 4 to inner margin connected by a slight punctiform line; a punctiform subterminal line expanding into a spot in discal fold; a punctiform brown terminal line. Hindwing grey-white, the terminal area suffused with brown.

Habitat.—CEYLON, Maskeliya (Alston). *Exp.* 14 mill. Type in B. M.

4754*a*. SCOPARIA ALBIFUSALIS, Hmpsn., A. M. N. H. (7), xix, p. 24 (1906).

♀. Head, thorax and abdomen fuscous; palpi white at base; pectus and ventral surface of abdomen white; legs white and fuscous. Forewing fuscous sparsely irrorated with white; antemedial line white, oblique from costa to submedian fold; an ill-defined dark discoidal spot; postmedial line white, obtusely angled at vein 6; large white patches on termen at apex, discal and submedian folds connected by the white terminal line. Hindwing greyish fuscous with a fine pale line at base of cilia.

Habitat.—CEYLON; Bogowantalawa, Maskeliya. *Exp.* 16 mill.

PYRAUSTINÆ.

4765*a*. SUFETULA NITIDALIS, n. sp. (Plate E., f. 16.)

♀. Head yellowish with black streak on vertex; palpi yellowish white in front, black behind; maxillary palpi black with yellowish ring at middle and yellowish tips; antennæ blackish; thorax black-brown, the tibiæ and tarsi whitish; abdomen fuscous, the base greyish, the 2nd segment with whitish segmental line. Forewing fuscous brown with a cupreous gloss; a small black discoidal spot; some white points on apical half of costa; a slight whitish, minutely waved subterminal line, oblique from costa to vein 6, then inwardly oblique. Hindwing fuscous brown with a slight cupreous gloss, the basal half rather greyer with dark irroration; a black discoidal point; a white postmedial line with some black suffusion on its inner edge, slightly excurved from costa to submedian fold, then waved, incurved and retracted below vein 1; a slight dark terminal line; cilia grey at base followed by a black line, the tips whitish; the underside greyer with dark irroration, a black discoidal lunule.

Habitat.—CEYLON, Uva (de Mowbray). *Exp.* 20 mill. Type in B. M.

4766. MASSEPHA ABSOLUTALIS, insert *Massepha marginalis*, Swinh., A.M.N.H. (7), xvii, p. 287 (1906), a variety with the terminal area of forewing and apex of hindwing blackish.

4773*a*. PYCNARMON PULCHRALIS, Swinh., A. M. N. H. (7), viii, p. 135 (1901)

♀. Head and thorax white; tegulæ and patagia with fuscous brown fasciæ, the latter orange yellow at tips; fore tibiæ with black band; abdomen orange, with white segmental lines, the anal tuft black except at tips. Forewing pale orange-yellow; a subbasal black striga from costa; two straight antemedial lines, the outer expanding into a spot in cell; a medial line from vein 2 to inner margin; an oblique elliptical discoidal spot; postmedial line excurved from costa to vein 2, then retracted to the discoidal spot; a curved subterminal line; a terminal line; cilia whitish with a fuscous line through them. Hindwing pale orange-yellow; an oblique black line from costa before middle to above tornus: postmedial line oblique from costa to vein 2, then retracted to lower angle of cell; a curved subterminal line from costa to submedian fold; a terminal line; cilia white with a black line through them.

Habitat.—BURMA, Rangoon. *Exp.* 20 mill.

4784*a*. REHIMENA STICTALIS, n. sp. (Plate E., f. 25.)

♂. Head and thorax ochreous slightly tinged with brown; fore tibiæ fuscous above; abdomen ochreous with diffused fuscous dorsal bands on medial segments. Forewing ochreous, thinly scaled; an oblique fuscous subbasal line; a diffused fuscous antemedial erect line; a fuscous discoidal spot; a postmedial series of fuscous spots, the spot below costa displaced inwards, and those between veins 5·3 displaced outwards near termen which is tinged with fuscous. Hindwing ochreous, thinly scaled; a postmedial fuscous rather maculate band bent outwards to near termen between veins 5·3· the termen with a fuscous line towards apex and tinged with fuscous towards tornus.

Habitat.—CEYLON, Kandy (Mackwood). *Exp.* 18 mill. Type in B. M.

4784*b*. REHIMENA HYPOSTICTALIS, n. sp. (Plate E., f. 14).

Pale whitish brown or greyish fuscous; frons and vertex of head whiter; palpi fuscous at sides; pectus, legs and ventral surface of abdomen white. Forewing with the costal edge blackish; traces of an antemedial line from cell to inner margin; a black point in middle of cell and small prominent rather lunulate discoidal spot; postmedial line formed of small somewhat dentate blackish spots slightly oblique from costa to vein 3, then retracted to below end of cell and somewhat excurved again; a terminal series of blackish striæ; cilia fuscous with a fine pale line at base. Hindwing with the costal area white; a slight discoidal spot: a somewhat dentate postmedial line excurved between veins 5 and 2. Underside white; both wings with black discoidal point, the postmedial line represented by series of black points.

Habitat.—CEYLON, Galboda (Mackwood), Puttalam (Pole), Maskeliya (de Mowbray). *Exp.* 22-26 mill. Type in B. M.

4784*c*. REHIMENA VILLALIS, Swinh., A. M. N. H. (7), xvii, p. 287 (1906).

♀. Pale yellow; wings thinly scaled. Forewing with postmedial black bar from below costa to vein 7 and another between veins 5 and 2; the apex tinged with fuscous. Hindwing with obliquely curved postmedial black bar between vein 5 and submedian fold and black apical patch.

Habitat.—ANDAMANS. *Exp.* 20 mill.

4805. PAGYDA DISCOLOR insert (syn.) *Pagyda pulverulenta*, Swinh., A. M. N. H. (5), viii, p. 136 (1901).

A variety with the antemedial line of forewings and the subterminal line of both wings reduced to points.

4829*a*. SYNGAMIA OGGALIS, Swinh., A. M. N. H. (7), xvii, p. 288 (1906).

Head, thorax and abdomen very pale yellow; head tinged with brown, the palpi with fuscous; fore tibiæ with slight black band; abdomen with paired sublateral black spots on terminal segment, followed by a white bar, the anal tuft orange below. Forewing pale yellow; the costal area broadly and terminal area beyond postmedial line tinged with fuscous; a black point in middle of cell and discoidal bar; postmedial line excurved from costa to vein 2, then retracted to below angle of cell; cilia with a fine pale line at base. Hindwing pale yellow, the terminal half tinged with fuscous; a black discoidal point; postmedial line interrupted between veins 3 and 2, then slightly retracted and oblique to above tornus; a black terminal line; cilia pale yellow with a fuscous line through them.

Habitat.—ASSAM, Khasis. *Exp.* 26 mill.

4836. BOCCHORIS TELPHUSALIS insert (syn.) *Bocchoris fazanalis*, Swinh., A.M.N.H. (7), xvii, p. 208 (1906), a yellowish variety.

4867*a*. FILODES BILINEALIS, n. sp. (Plate E., f. 44).

♀. Head whitish and brown; palpi orange, brownish at tips; tegulæ fuscous with tufts of orange hair at sides; patagia fuscous edged with orange; thorax reddish orange; pectus and legs grey, the fore coxæ, femora and base of tibiæ tinged with orange ; abdomen reddish orange with lateral series of black spots, a black bar at base of terminal segment, the anal tuft blackish, the ventral surface grey. Forewing fuscous ; the basal area orange to the oblique black antemedial line ; black spots in base and middle of cell and a black discoidal lunule ; a dark diffused curved postmedial line ; terminal area greyish. Hindwing fuscous, the base slightly tinged with orange ; a black discoidal spot ; traces of a diffused dark postmedial line ; the terminal area greyish.

Habitat.—CEYLON, Wellawaya (Green). *Exp.* 38 mill. Type in B. M.

4874. NEVRINA PROCOPIA insert (syn), *Euglyphis falsalis*, Swinh., A. M. N. H. (7), xvii, p. 290 (1906).

Under PHRYGANODES, insert *Saroscelis* Meyr. Trans. Ent. Soc.

Type.

1894, p. 461 ... ... *nicoalis*.

Antennodes, Swinh., A. M. N. H. (7), xvii, p. 291 (1906)... ... *radicalis*.

Hind tibiæ of male strongly curved at middle and fringed with short hair on outer side and long hair on inner, the inner spurs extremely long.

4879*a*. PHRYGANODES NICOALIS, Wlk., xvii, 700 (1859). Swinh. Cat. Het. Mus. Oxon., ii., pl. viii, f. 13.

Saroscelis earlalis, Swinh. A. M. N. H. (7), xvii, p. 299 (1906).

Fuscous brown ; palpi whitish in front ; fore tibiæ and tarsi whitish banded with black ; mid and hind tibiæ whitish ; abdomen with pair of blackish spots before the anal segments which is whitish, the ventral surface whitish. Forewing with curved blackish antemedial line ; a blackish discoidal bar ; postmedial line somewhat diffused, slightly bent outwards and dentate between veins 6 and 3, then retracted to near angle of cell ; a whitish slightly waved terminal line. Hindwing with oblique blackish discoidal bar ; postmedial line oblique from costa to vein 4, then retracted to lower angle of cell and oblique to tornus ; a whitish terminal line slightly waved at middle ; a fuscous line at base of cilia ; the underside with the inner area whitish, a small discoidal spot and curved punctiform postmedial line from costa to vein 2.

Habitat.—ASSAM, Khasis ; SINGAPORE ; BORNEO ; SUMBAWA. *Exp.* 34 mill.

4879*b*. PHRYGANODES ORIGOALIS, Wlk., xviii, 681 (1859).

Omiodes nigriscripta, Warr., A. M. N. H. (6), xvii, p. 132 (1896).

Hind tibiæ of male tufted with hair, the mid and hind tarsi fringed with hair. Rufous ; palpi white at base ; pectus white in front ; tarsi and ventral surface of abdomen white. Forewing with obliquely curved brown antemedial line ; a discoidal bar ; postmedial line excurved from costa to vein 3, then retracted to below angle of cell ; a fine punctiform black terminal line ; cilia rufous at base with dark medial line and white tips with brown patch at middle. Hindwing with slight oblique discoidal bar ; postmedial line obliquely excurved from costa to vein 3, then retracted to near angle of cell and oblique to submedian fold where it terminates ; a fine dark terminal line ; cilia rufous at base, with dark medial line and white tips with brown patch at middle ; the underside with the inner and terminal areas tinged with greyish, a discoidal point and punctiform postmedial line incurved below vein 3.

Habitat.—NICOBARS; BORNEO; CELEBES. *Exp.* 34 mill.

4879*c*. PHRYGANODES FLOCCULENTALIS, Hmpsn., P. Z. S., 1889, p. 680, pl. 50, f. 4.

Hind tibiæ of male with very thick fringe of black hair from medial spurs to extremity; costa of forewing with immense tuft of flocculent hair covered by large flattened scales on basal half below and somewhat excised at middle.

Grey suffused with ochreous brown and fuscous; fore tarsi white; abdomen with black rings on two penultimate segments. Forewing with the costa somewhat more ochreous; a black striga across base of cell; a curved blackish antemedial line, a small black discoidal spot; a somewhat diffused blackish postmedial line, excurved and minutely waved to vein 2, then retracted to origin of vein 2, oblique to submedian fold and minutely waved to inner margin; a terminal series of small fuscous lunules; cilia fuscous with a whitish line at base. Hindwing with blackish discoidal spot; postmedial line blackish, oblique and minutely waved to vein 2, then retracted to lower angle of cell and oblique to above tornus; a fuscous terminal line; cilia fuscous with whitish line at base; the underside whiter.

Habitat.—CEYLON, Maskeliya (Pole); PULO LAUT. *Exp.* 26-34 mill.

4880*a*. PHRYGANODES CHRYSALIS, n. sp. (Plate E., f. 45.)

♂. Thorax with tufts of long yellowish hair from below base of forewing and tufts of long fuscous hair from below base of hindwing.

Orange yellow; shoulders with black spots; fore tibiæ with fuscous spots; abdomen with dorsal fuscous spot on penultimate segment. Forewing with subbasal black spots below costa and on inner margin, a slightly curved antemedial band: small spot in middle of cell and large discoidal spot; a postmedial band excurved between veins 6 and 2, then bent inwards to below end of cell and sinuous to inner margin; a terminal band broad at costa and narrowing to tornus. Hindwing with small discoidal spot; a postmedial band excurved between veins 6 and 2, then bent inwards to below end of cell and oblique to inner margin; a terminal band, somewhat widening towards apex and obsolete towards tornus.

Habitat.—CEYLON, Ohiya (F. H. Gossage). *Exp.* 30 mill. Type in B. M.

4887. PHRYGANODES CRITHONALIS insert (syn.) *Omiodes ovenalis*, Swinh., A. M. N. H. (7), xvii, 289 (1906).

4888. *a*. PHRYGANODES ERADICALIS, n.sp.

Antennodes radicalis, Swinh., A. M. N. H. (7), xvii, p. 291 (1906) part nec. Wlk.

Antennæ of male with a tuft of hair on upperside of shaft about three-4ths from base; hind tibiæ short and curved, the tibia and tarsus fringed with long hair above; inner margin of hindwing fringed with long hair.

Fuscous brown; palpi in front, pectus and legs pale rufous; abdomen with the ventral surface whitish. Forewing with faint dark spot in middle of cell and discoidal lunule; traces of a diffused postmedial line, straight from costa to vein 4, then incurved. Hindwing with traces of a diffused curved postmedial line; the under side greyish.

Habitat.—ANDAMANS ; SINGAPORE. *Exp.* 36 mill. Type in B. M.

4892*a*. DICHOCROCIS ATRISECTALIS. n. sp.

♀. Orange yellow ; palpi black above ; fore tibiæ blackish at tips; abdomen with subdorsal black spots on 2nd segment. Forewing with subbasal black spot on inner margin; a strong antemedial black bar from costa ; a slight striga below origin of vein 2, a strong postmedial black bar from costa with traces of a line from it to vein 3 ; a spot just above inner margin towards tornus. Hindwing with slight black postmedial spots above vein 5 and below 2 and a slight spot below vein 2 just before termen.

Habitat.—ANDAMANS. *Exp.* 30 mill. Type in B. M.

4907. DICHOCROCIS MEGILLALIS insert (syn.) *Dichocrocis reisealis*, Swinh., A. M. N. H. (7), xvii. p. 292 (1906).

4919*a*. NACOLEIA SILVOSALIS, Swinh., A. M. N. H. (7), xviii, p. 416 (1906).

♂. Ochreous yellow ; palpi whitish, fuscous at tips ; prothorax tinged with brown; abdomen tinged with brown at extremity ; pectus, legs and ventral surface of abdomen white. Forewing with the costal and terminal areas suffused with brown ; an oblique sinuous antemedial line ; a black point in middle of cell and discoidal bar ; postmedial line excurved from below costa to vein 3 ; bent inwards to below end of cell, then again excurved : cilia whitish with a slight brown line near base. Hindwing with blackish discoidal point ; postmedial line excurved between veins 6 and 2 ; a narrow brown terminal band ; cilia whitish with slight brown line near base.

Habitat. —ASSAM, Khasis. *Exp.* 22 mill.

4937*a*. NACOLEIA TUMIDICOSTALIS, n. sp. (Plate E, f. 27.)

Antennæ of male rather dilated and curved at middle but without tuft of hair ; the claspers and genital tufts very large ; forewing with the basal half of costa clothed with rough black scales, then expanding into a slight lobe curved over below, the veins below it down curved.

♂. Ochreous white ; palpi, frons and shoulders black ; fore tibiæ black, white at extremity, the tarsi with dark bands ; anal tuft black and brown. Forewing with the basal half of costal area clothed with rough black scales ; traces of a sub-basal line ; an indistinct waved antemedial line ; a slight discoidal lunule ; postmedial line indistinct, strongly excurved at middle, then retracted to below end of cell ; a terminal series of slight points. Hindwing with discoidal spot ; an indistinct minutely waved postmedial line strongly excurved at middle, then retracted to below end of cell ; a terminal series of black points.

Habitat.—MADRAS, Bellary, Ramandrug, 3000′ (Campbell). *Exp.* 20 mill. Type in B. M.

4941*a*. NACOLEIA FUSCICILIALIS, n. sp.

♀. Head, thorax and abdomen pale brownish ochreous ; palpi, frons and a streak below shoulders fuscous. Forewing pale brownish ochreous ; a small, dark spot in middle of cell and interrupted line from cell to inner margin ; a small discoidal lunule defined by blackish; a punctiform postmedial line bent outwards between veins 5 and 2, then retracted to below end of cell: a terminal series of black striæ; cilia fuscous. Hindwing whitish tinged with brownish ochreous; a punctiform dark postmedial line bent outwards between veins 5 and 2, then almost obsolete, retracted to below angle of cell and sinuous to above tornus; a fine dark terminal line; cilia tinged with fuscous from apex to vein 2.

Habitat.—SIKHIM, 1800′ (Dudgeon). *Exp.* 22 mill. Type in B. M.

4941*b*. NACOLEIA NIGRICOSTALIS, n. sp. (Plate E., f. 36.)

♂. Rufous; palpi and frons black, the former whitish at base; fore tibiæ at extremity and mid tibiæ at base and the tarsi blackish; abdomen ventrally whitish. Forewing with the costa narrowly black; antemedial line represented by some blackish scales between cell and inner margin; traces of a punctiform postmedial line, slightly excurved between veins 5 and 2, then retracted; a terminal series of black points. Hindwing with traces of a punctiform postmedial line excurved between veins 5 and 2, then retracted; a terminal series of black points; the underside pale with the postmedial line more distinct and minutely dentate.

Habitat.—BURMA, Moulmein, *Exp.* 28 mill. Type in B. M.

4972*a*. SYLEPTA STRAMINEA, Butl., A. M. N. H. (4), xvi, p. 416 (1875).

Pale yellow; palpi white, fulvous at tips; shoulders fulvous; fore femora fulvous at extremity, the tibiæ with fuscous bands. Forewing with the costal area tinged with fulvous; a fuscous antemedial line oblique from costa to submedian fold and with slight spot beyond it in cell; a discoidal spot; postmedial line excurved between veins 5 and 2, then retracted to below angle of cell and oblique to inner margin: a terminal series of fuscous striæ; a fuscous line at base of cilia. Hindwing with oblique discoidal bar; the postmedial line excurved between veins 5 and 2, then retracted to below angle of cell and oblique to inner margin; a terminal series of fuscous striæ; a fuscous line at base of cilia.

Habitat.—NATAL; CEYLON, Uva (Alston). *Exp.* 26 mill.

4981*a*. SYLEPTA DISTINGUENDA, Herring, Stett. Ent. Zeit., lxii, p. 77 (1901): id. lxiv., pl. 1, f. 16.

Pale straw yellow; head and tegulæ tinged with orange; palpi with patch on 2nd joint, pectus, legs and abdomen whitish. Forewing with the costal area tinged with orange; an obliquely curved antemedial dark line; a point in middle of cell and discoidal lunule; postmedial line obliquely incurved from costa to vein 4 where it is bent outwards, at vein 2 retracted to lower angle of cell, then again excurved; terminal area suffused with brown narrowing to tornus. Hindwing with oblique discoidal striga; postmedial line bent outwards and oblique between veins 5 and 2, then retracted to below angle of cell and oblique to tornus; terminal area suffused with brown, narrowing to tornus; cilia white with a fine dark line at base.

Habitat.—ASSAM, Khasis; SUMATRA. *Exp.* 30 mill.

5004*a*. LYGROPIA SHEVAROYALIS, n. sp. (Plate E., f. 46.)

♂. Head, thorax and abdomen straw-yellow mixed with fuscous back, the last with the segments dorsally banded with white. Forewing straw-yellow, the costa fuscous to the postmedial line; a diffused fuscous sub-basal band with yellow points on each side of it below costa; an ill-defined antemedial line, excurved to submedian fold, then incurved; the medial area black leaving some small yellow spots near the lines and a prominent discoidal spot. postmedial line oblique and waved from vein 4 to inner margin, the area beyond it yellow to the subterminal line which is dentate, defined on outer side by a waved yellow line from costa to vein 5 and between veins 4 and 2, below vein 2 merged in a diffused fuscous patch; terminal area blackish: cilia with yellow points at base. Hindwing straw-yellow slightly tinged and irrorated with fuscous; an oblique waved antemedial line ending above tornus; a dentate postmedial line bent outwards between veins 4 and 2: the termen suffused with fuscous; cilia yellowish at base.

Habitat.—S. INDIA, Shevaroys (W. H. Campbell). *Exp.* 34 mill. Type in B.M.

p. 345. Under GLYPHODES insert Sect. *Torquela*, Swinh., A. M. N. H. (7), xvii, p. 382 (1906), for *G. ophiceralis*.

5043. GLYPHODES LACUSTRALIS, insert *Margaronia salmenalis*, Swinh., A. M. N. H. (7), xvii, p. 294 (1906), ab. with the white fascia on forewing conjoined to the postmedial patch.

p. 361. Under PYGOSPILA insert Sect. *Telespasta*, Swinh., A. M. N. H. (7), xvii, p. 294 (1906) for *P. cuprealis*.

5083*a*. SAMEODES HEDYCHROALIS, Swinh., A. M. N. H. (7), xix, p. 54 (1907).

♀. Orange yellow; fore tibiæ with terminal black band. Forewing with fuscous subbasal point on medial nervure; a strong curved fuscous antemedial line; a slight discoidal lunule; postmedial line minutely waved, oblique from below costa to vein 5, then retracted to near angle of cell and excurved below submedian fold; a curved subterminal series of fuscous striæ. Hindwing with curved fuscous line just beyond middle from vein 2 to inner margin; postmedial points on veins 5 and 4 and subterminal points on vein 3, in submedian fold and on vein 1.

Habitat.—ANDAMANS, Port Blair. *Exp.* 26 mill.

5110*a*. ISOCENTRIS RUBRALIS, Swinh., A. M. N. H. (7), xvii, p. 295 (1906).

Head, thorax and abdomen fulvous red; palpi at base, pectus, legs, and base of ventral surface of abdomen white; fore tibiæ banded with fulvous, the subterminal joint of fore tarsi black. Forewing fulvous red, a curved slightly waved fine antemedial brown line; a slight discoidal lunule; postmedial line fine, black at costa, then brown, obliquely excurved from costa to vein 3, then retracted to lower angle of cell and excurved to inner margin; an indistinct minutely waved curved subterminal line; a fine reddish terminal line; cilia pure white with minutely waved black line at base. Hindwing fulvous red; a fine postmedial line obliquely excurved from costa to vein 3, then retracted to lower angle of cell and oblique to inner margin: traces of a minutely waved subterminal line ; a fine reddish terminal line ; cilia pure white with minutely waved black line at base.

Habitat.—SIKHIM ; ASSAM, Khasis. *Exp.* 24 mill.

5124*a*. CROCIDOPHORA HABISALIS, Wlk., xviii, 702 (1859).
Rhodaria mævialis, Wlk., xix, 925 (1859).

Head, thorax and abdomen yellow, palpi, frons and extremity of abdomen tinged with rufous ; base of palpi, pectus and legs white. Forewing yellow, the costal area and a diffused subterminal band rufous ; a slight rufous streak above inner margin near base ; an oblique slightly sinuous rufous antimedial line ; a faint discoidal lunule ; postmedial line rufous, interrupted, rather punctiform, excurved below costa, oblique to lower angle of cell, then retracted to origin of vein 2 and again excurved to inner margin ; a terminal series of slight dark points ; cilia rufous at apex. Hindwing pale yellow ; traces of an oblique postmedial line between veins 4 and 2 ; a diffused rufous terminal band from apex to vein 2 leaving the termen yellow with dark points on it ; cilia pale yellow, brown at middle.

Habitat.—ASSAM, Khasis ; MADRAS, Wynád ; BORNEO. *Exp.* 24 mill.

5138. TETRIDIA CALETORALIS insert (syns) *Botys phænnisalis*, Wlk., xviii, 684 (1859) and *Calamochrous homochroalis*, Swinh., A. M. N. H. (7), xix, p. 55(1907).

5160*a*. PACHYZANCLA HIPPONALIS, Wlk., xvii, 374 (1859).
Botys pigresalis, Wlk., xviii, 724 (1859).

Ochreous tinged with rufous ; head, tegulæ and shoulders tinged with fuscous brown ; palpi whitish below, legs whitish, the fore tibiæ with black terminal band. Forewing slightly irrorated with brown ; the costal area to postmedial line and the apical area suffused with fuscous ; an oblique waved antemedial line excurved below cell, a small black spot in middle of cell and another on discocellulars ; postmedial line dentate, excurved between veins 5 and 2 and incurved at discal and submedian folds. Hindwing slightly irrorated with brown, the costal area whitish ; a small black discoidal spot ; the postmedial line bent outwards and dentate between veins 5 and 2 ; diffused fuscous subterminal and terminal bands.

Habitat.—CEYLON, Kalutara ; FORMOSA ; N. S. WALES. *Exp.* 20 mill.

5167*a*. PHLYCTÆNODES *subvitrealis*, insert *Eurycreon* OCULIFERA. Herring. Stett. Ent. Zeit., lxii, p. 98 (1901), id. pl. 1, f. 20 (1903), which has priority.

5169*b*. PHLYCTÆNODES LEUCONEURALIS, n. sp. (Plate E., f. 17.)

♀. Head and thorax reddish brown mixed with some white ; sides of frons and antennæ white ; abdomen white irrorated with brown and with white segmental lines. Forewing whitish thickly irrorated and suffused with fuscous brown, the veins streaked with white ; a white streak below the cell to below origin of vein 2 ; a blackish streak in middle of cell with white streaks above and below it ; an obscure discoidal lunule ; a strong oblique minutely waved postmedial white line ; a strong white line just before termen ; cilia white with two fuscous lines through them. Hindwing whitish thickly irrorated and suffused with fuscous, the veins of terminal area slightly streaked with white ; a curved white postmedial line ; a minutely waved white line just before termen ; cilia white with two fuscous lines through them.

Habitat.—AFGHANISTAN, Peshin Valley (Nurse). *Exp.* 32 mill. Type in B. M.

5194*a*. CALAMOCHROUS SARCALIS, n. sp. (Plate E., f. 37.)

♀. Head, thorax and abdomen ochreous, the ventral surface, sides of frons and antennæ white. Forewing fleshy ochreous, the veins finely streaked with brown, the interspaces of terminal area with fine brown streaks, the one in discal fold rather more prominent ; the costal edge white ; cilia red-brown. Hindwing golden-yellow, the cilia white at tips.

Habitat.—CEYLON, Kandy (Green). *Exp.* 34 mill. Type in B. M.

5195*a*. CALAMOCHROUS PURPURALIS, n. sp. (Plate E., f. 26.)

♀. Head and thorax purple-red and grey ; abdomen grey dorsally suffused with purple red. Forewing silvery grey with slight dark striation ; some purple-red suffusion especially on medial area ; costa red with a dark line below it ; a waved blackish antemedial line oblique from costa to submedian fold where it is angled ; a black discoidal bar ; the postmedial line dentate, oblique from costa to vein 2, then retracted ; a black terminal line ; apical part of costa and cilia orange-yellow, the latter with crimson line at base. Hindwing grey-white tinged with fuscous especially on terminal area towards apex ; a wedge-shaped crimson patch above vein 2 expanding to vein 4 at termen and crossed by an oblique subterminal dark bar ; cilia yellow.

Habitat.—CEYLON, Gampola (Mackwood). *Exp.* 22 mill. Type in B. M.

5196*b*. CYBOLOMIA CERVINALIS. n. sp. (Plate E., f. 35.)

♀. Head and thorax pale fawn-brown ; frons white at sides ; pectus and legs white ; abdomen whitish tinged with fawn colour. Forewing pale fawn-brown ; a narrow white antemedial band edged by black scales, slightly excurved from costa to discal fold, then slightly sinuous : a small white discoidal spot defined by fuscous ; a narrow white postmedial band arising from a blackish spot on costa and edged by blackish scales, excurved from costa to vein 5, then incurved ; termen tinged with brown ; a fine dark terminal line : cilia white. Hindwing whitish suffused with brown, the inner area paler ; a curved dark postmedial line ; a crenulate interrupted black terminal line ; cilia yellowish at base, then with fine dark line and white tips ; the underside white sparsely irrorated with brown, a minutely waved postmedial line and terminal series of black points.

Habitat.—PUNJAB, Campbellpur (Yerbury). *Exp.* 22 mill Type in B. M.

5213*a*. PIONEA SCOPICALIS, n. sp. (Plate E., f. 28.)

♀. Pale ochreous yellow ; head and thorax mostly fuscous ; frons whitish ; fore tibiæ black ; abdomen dorsally tinged with reddish brown, the base whitish. Forewing with some opalescent suffusion ; the costal edge black to middle ; the base with rather streaky black suffusion ; a medial band formed of diffused black streaks ; an oblique black postmedial line retracted at vein 5 to upper angle of cell and enclosing a small ochreous discoidal lunule, a black band on outer edge of postmedial line, leaving a little ochreous on costa and inner margin and a terminal ochreous band expanding at middle; a terminal series of black points. Hindwing with indistinct curved subterminal line with faint brownish suffusion beyond it.

Habitat.—CEYLON, Uva, 600′ (Mackwood, Alston). *Exp.* 14 mill. Type in B. M.

5250. *Pyrausta* GRISEIFUSA is a CROCIDOPHORA next to 5123 *C. lutusalis*, but with the median nervure curved upwards after the scale fan.

5253*a*. PYRAUSTA PHRAGMATIDALIS, n. sp.

♀. Pale yellow; palpi rufous, white below · throat white; tibiæ and tarsi white, the fore tibiæ with fuscous band near extremity. Forewing with the basal half of costal area faintly tinged with rufous: the veins brownish; a pale brownish antemedial line oblique from costa to submedian fold; a small spot in middle of cell and discoidal lunule, postmedial line waved, incurved from costa to vein 5, bent outward between veins 5 and 3, then retracted to lower angle of cell and erect to inner margin; a waved subterminal line, excurved from costa to submedian fold where it is angled inwards; a fine brownish terminal line; cilia pale rufous at base, whitish at tips. Hindwing with waved pale brown postmedial line, bent outwards between veins 5 and 2, then retracted to lower angle of cell and oblique to inner margin above tornus: a curved waved subterminal line from costa to termen at vein 1; a fine brown terminal line; cilia pale rufous at base, whitish at tips.

Habitat.—SIKHIM, Kurseong (C. Swinhoe). *Exp.* 28-32 mill. Type in B. M.

5271*a*. TEGOSTOMA DISPARALIS, Herr. Schäff. Eur. Schmitt., vi, p. 140, Pyr. ff. 134-5 (1856), Staud. Cat. Lep. pal., p. 69.

Head and thorax grey-brown; palpi at base pectus and legs white; abdomen pale grey-brown. Forewing grey-brown tinged with ochreous and irrorated with white; an indistinct oblique antemedial line; a blackish point in middle of cell and discoidal lunule, an indistinct curved postmedial line, a slight dark terminal line. Hindwing pale brownish ochreous, the terminal area suffused with brown; cilia brown at base, white at tips.

Habitat.—ARMENIA; ASIA MINOR; W. TURKISTAN: AFGHANISTAN, Kandahar; SIND, Karachi. *Exp.* 22 mill.

5272*a*. TEGOSTOMA TROPHOTALIS, n. sp. (Plate E., f. 34.)

♂. Head and thorax pure white; palpi and lower part of frons brown: tibiæ and tarsi banded with brown; abdomen brown mixed with whitish on central surface, the anal tuft ochreous. Forewing pure white; the base of costal edge brown; an oblique brown antemedial line rather diffused on inner side; postmedial line blackish, oblique, rather incurved at vein 6, then minutely dentate to vein 2, a diffused brown band on its outer edge dentate at middle; a diffused maculate terminal brown band. Hindwing fuscous brown, the cilia pure white; the underside whitish tinged with brown.

Habitat.—BELOOCHISTAN, Quetta (Nurse). *Exp.* 26 mill. Type in B. M.

(*To be continued*).

THE ORCHIDS OF THE BOMBAY PRESIDENCY

BY

G. A. GAMMIE, F.L.S.

PART VI. (WITH PLATES V. AND VI.,

(*Continued from page* 91 *of this Volume.*)

13. CYMBIDIUM.

A densely tufted epiphyte. *Roots* numerous. *Leaves* long, thick, strap-shaped, equitant at base. *Racemes* long, pendulous, loosely sheathed. *Flowers* moderately large. *Sepals* uniform linear, *petals* similar in shape to but smaller than the sepals, *lip* 3-lobed, sessile, midlobe recurved. *Column* rather long, *anther* imperfectly 2-celled, *pollinia* in two coalescing pairs, sessile on the broad gland.

1. CYMBIDIUM ALOIFOLIUM, *Sw.* Fl. Br. Ind. VI., p. 10. Cooke, Fl. of Bombay II, p. 696; Dalz. & Gibs. p. 266, *C. bicolor*, Lindl.

Leaves rather stiff, about 1 foot to 18 inches long by 1 inch broad, *racemes* pendulous, up to 18 inches long; *flowers* many, loosely arranged, 2½ inches in diameter; *sepals* linear oblong, subacute, 1⅛ inch by ⅛ inch, purplish brown on the centre longitudinally, with dull yellow margins; *petals* ⅝ inch long, coloured as in sepals and a little broader; *lip* ¾ inch long, narrow, side lobes pointing forward, purplish brown above, yellowish brown beneath; *disk* yellow, midlobe oblong, recurved, bright yellow, with two irregular, purplish brown ridges which coalesce at apex; *column* purplish brown.

Flowers appear from May to July.

Common on trees on the North Kanara and Belgaum Ghats and conspicuous throughout the year by reason of its bulk.

Dalzell and Gibson record it from Salsette, but its occurrence so far north in the Konkan is doubtful.

Dr. Cooke says that in this species the petals are as long as the sepals. I find them invariably shorter by half an inch. It is therefore possible that more than one variety exists.

Distribution.—Northern and Western India in heavy rainfall tracts. Andamans, Ceylon and Malaya.

Details of Plate V.—Cymbidium aloifolium, *Sw.* (Cymbidium bicolor, *Ldl.* on plate).

1. Part of leaf—nat. size.
2. Part of infloresence —nat. size.
3. Reduced sketch of plant to show habit.

14. GEODORUM.

Terrestrial, with globose tubers, the annual leaf sheaths forming a short stem. *Leaves* elliptic acute, plicate, *peduncles* rising from the root stocks, enclosed in the sheaths of the young leaves. *Flowers* densely clustered at the top of the scape, racemose ; *sepals* subequal, the uppermost flat, the lateral distinctly ribbed on back and keeled towards the tips, *petals* not keeled, a little larger and broader than sepals, *lip* with a broad and very short sac at base, *lateral lobes* shallow and long ; *disk* channelled, midlobe very shortly emarginate: *column* short, stout, pollinia 2, attached by a slender caudicle to a small broad gland.

1. Geodorum dilatatum, *R. Br.*; Fl. Br. Ind. VI, p. 17 ; Cooke, Fl. of Bombay II, p. 695 ; *G. purpureum*, Br. ; Dalz. and Gibs. p. 266.

Tubers 1¼ inch in diameter. *Leaves* up to a foot long, bright green, membranous, tapering downwards into a long sheath. *Peduncle* exceeding the leaves, *bracts* lanceolate acute, green, 3-nerved, ¾ inch long, *ovary* shorter ; *sepals* ½ inch long, white, deeply suffused with pink, *petals* coloured as in sepals, *lip* as long as petals, white, streaked with purple on the lateral lobes ; *disk* oblong, yellow spotted with purple, midlobe purple.

Flowers in June.

Collected by Mr. Spooner on the Belgaum and North Kanara Ghats.

Distribution.—Western Peninsula, North Eastern India, Andamans, Ceylon.

15. POLYSTACHYA.

Epiphyte. *Pseudobulbs* successively formed, older green, triannulate, compressed, longitudinally striate. *Leaves* 4, distichous, *petioles* broadly sheathing, laterally compressed, *blade* articulated, *scape* racemose, rising from the latest pseudobulb, *peduncle* invested at base with four compressed sheaths. *Flowers* resupinate, in a cluster at the apex of the peduncle, *bracts* minute, *ovary* subsessile, *dorsal sepal* small, ovate acute, *lateral* a little larger, *petals* shorter than sepals and very narrow, *lip* broader than long, 3-lobed, lateral lobes small, rounded, midlobe much larger, slightly toothed ; *disk* furfuraceous, with short white, loose, moniliform hairs ; *column* short, *anther* sub-2-celled, *pollinia* 4, ovoid, cohering in pairs to a very short gland.

1. POLYSTACHYA WIGHTII, *Rchb. f.*: Fl. Br. Ind. VI, p. 21. *Pseudobulbs* about ½ inch long, ovate. *Leaves* linear oblong, emarginate, the two lower small, the two upper 4½ and 6 inches long by ¾ inch broad, *scape* scarcely reaching to half the length of the upper leaf or sometimes exceeding it. *Flowers* ¼ inch in diameter, in clusters of 10 or 12, on a puberulous rachis, *ovary* ½ inch long, *sepals* yellow, laterals slightly keeled on back, produced at base into a short spur, *petals* yellow, *lip* white.

Flowers in June.

This has not hitherto been recorded from Bombay, although it is moderately abundant in the ghat forests of Belgaum and North Kanara.

Distribution.—Western Peninsula to the southward.

16. LUISIA.

Epiphytes. *Stems and leaves* similar, quill-like. *Flowers* dark coloured, on very short spikes rising through the sheaths on internodes, *bracts* short, thick, imbricating. *Sepals*, subequal, *petals* as long or much longer than the lateral sepals, *lip* sessile, the basal part concave, the apical part thick and ridged. *Column* short, *anther* 2-celled, *pollinia* 2, attached by a broad caudicle to a short gland.

Petals as long as lateral sepals ; apex of *lip* entire. 1. *L. teretifolia.*
Petals much longer than lateral sepals, apex of *lip* bilobed. 2. *L. tenuifolia.*

1. LUISIA TERETIFOLIA, *Gaud.* Fl. Br. Ind. VI, p. 22; Cooke, Fl. of Bombay II, p. 701.

Stems erect and spreading, up to 20 inches long, about ¼ inch in diameter. *Leaves* up to 5 inches long, cylindrical obtuse. *Peduncles* short, thick, issuing from the sheaths on internodes. *Flowers* in short congested racemes, each ¾ inch in diameter, sessile, *ovary* twisted, channelled, *sepals* thick, oblong, greenish yellow and suffused with brown externally, upper slightly keeled, lateral distinctly so towards the tips, *petals* yellow, distinctly longer than sepals, oblong obtuse apiculate, *lip* dark purple, with faint, thin, yellow veins, under surface yellow, lateral lobes narrow, rounded, terminal broadly cordate cuneate obtuse, *column* stout, uniformly dark brown.

Flowers appear in May and June. The plant is common on the Ghats to the southwards.

Distribution.—Eastern Himalayas, Bengal, Assam, Burma, Andamans, Western Peninsula, Ceylon.

2. LUISIA TENUIFOLIA, *Blume.* Fl. Br. Ind. VI. p. 24 ; Dalz. & Gibs, p. 266 ; Cooke, Fl. of Bombay II., p. 702.

Stems slender, pendulous, up to 2 feet long, *leaves* up to 8 inches long, rather more slender than in the last species. *Flowers* in short spikes, 1¼ inch in diameter, *sepals* yellow, suffused with purple, *dorsal sepal* broad oblong obtuse, *lateral* ovate, smaller, *petals* coloured as in sepals, linear obtuse, falcate, nearly as long again as lateral sepals, *lip* with a dull white ground colour, thick, convex, almost fiddle-shaped, base broad with two lateral earlike-lobes, *disk* long, with a large quadrate, purple blotch near base, and three long channels upward terminating in a purple 2-lobed, fish-tail-like apex.

Flowers from May to August. Moderately common on trees on the Belgaum and North Kanara Ghats.

There is also a variety with exceedingly slender stems and leaves and smaller flowers. The lip in these has the basal lobes scarcely defined, the purple blotch towards the base of the disk is oval with a very irregularly crenate margin, a few scattered spots are continued towards the apex, which is devoid of any purple suffusion, and the three calli on the forward part of the disk are very short and broad.

Distribution.—Western Peninsula, Ceylon.

17. COTTONIA.

Epiphyte. *Stems* bearing equitant, strap-shaped leaves which are deeply bilobed at apex. *Peduncles* very long, erect, slender and wire-like, bearing a few flowers in a crowded raceme at the top. *Flowers* facing upwards, *sepals* subequal, patent, *petals* slightly narrower than sepals, *lip* elongate fiddle-shaped, resembling a bee in shape and coloration, *column* short, *anther* 2-celled, pollen in two cohering pear shaped pairs, *caudicle* long, narrow, gland small.

1. COTTONIA MACROSTACHYA, *Wight.* Fl. Br. Ind. VI, p. 26 ; Cooke, Fl. of Bombay II, p. 702 ; Dalz. & Gibs., p. 268.

Stem at first short, ultimately becoming about 6 inches long, clothed with the sheathing petioles of fallen leaves. *Leaves* 4 to 8 inches long, leathery, dark green, strap shaped, lax, *apex* 2-lobed, one lobe usually much larger than the other, peduncle one on each plant usually single but sometimes branched, up to 2 feet long, green or brown, wire-like, erect, flexuous, *bracts* scattered, small, brown. *Flowers* ¾ inch in diameter ; stalks with ovary up to ¾ inch long, *sepals* and *petals* brown with lighter longitudinal lines, dorsal sepal oblong obtuse with a hooded tip, lateral ovate apiculate, *petals* as long as the sepals but narrower, oblanceolate obtuse, *lip* $\frac{1}{3}$ inch long, with two small, yellow margined auricles a t base, side lobes elongate rounded, margined with yellow and densely ciliate, midlobe broadly retuse, each lobe being falcately oblong with slightly toothed outer margins, *disk* deep velvetty brown purple with a bullate surface, the whole resembling a small brown bee.

In flower from April to June.

Common on trees on the Belgaum and North Kanara Ghats.

Distribution.—Western Peninsula, Ceylon.

Details of Plate VI.—Cottonia macrostachya, *Wight.* A plant in flower and detached flower (all natural size).

(*To be continued.*)

CATERPILLARS AS ANTS' PETS.

BY

E. BLATTER, S.J.

have nothing new to write on the above subject, but I wish to w attention to the fact that Mr. H. Viehmeyer, a Continental omologist, is making a special study of the relations existing tween the caterpillars of certain butterflies and the ants. The eginning of a solution of many an interesting enigma in this respect as been made, but unfortunately most of these studies fail for want f the necessary materials. By giving a few notes on the subject I should like to interest the members of our Society in observations regarding the mutual relations of the two classes of insects in order hat we may be able to contribute in some way towards the scientific treatment of the question. In an early volume of our Journal[1] we find a paper on "Butterflies and Ants" by Lionel de Nicéville. "That there should be any connection between butterflies and ants," he says, "is known to few, though as regards one family of butterflies at least this relation is a very close and intimate one. As a rule, ants are the most deadly and inveterate enemies of butterflies, and ruthlessly destroy and eat them whenever they get the chance, as I have frequently found to my sorrow, when in a single night a fine brood of larvæ has been carried off by ants from the food-plant growing in tubs in my verandah, and not a single one has been left by the morning. In the case, however, of the larvæ and pupæ of some *Lycænidæ*, not only do the ants restrain their natural appetites by not eating these tempting morsels, but they take the greatest care of the larva, defend them from their enemies to the best of their ability, and when they are about to turn to pupæ, conduct them to a safe place, where they may perform their transformations, and allow the newly emerged and at first helpless butterflies to escape unmolested." The ants, however, are not quite so disinterested as it might appear from the above description. They know well that the caterpillars secrete a sweet liquid from an oval opening in the dorsal line of the eleventh segment. This fluid is a much coveted and favourite food for ants. Beyond the slit on the eleventh, these *Lycænid* larvæ have on the upper side of the twelfth segment two small peculiar tubes or tentacles, which can be stretched out and

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[1] Journal, B. N. H. S., Vol. III, p. 164.

drawn in, and which bear at the tips a bristle-like crown. De Nicévil is of opinion "that they were originally developed in the larv drive away their enemies, probably Ichneumon-flies, much as tentacula behind the heads of *Papilio* larvæ are used." Whe these extensile organs occur only in connection with the transv slit, we cannot say at present. According to Viehmeyer, the ca pillars he observed always showed both or neither tokens, and or with some larvæ of the genus *Thecla* he was unable to come to definite decision. DeNicéville describes the larva of *Curetis theti.* Drury (a Bombay butterfly), in the following way: "The twelfth segment bears two most extraordinary structures which consist of two diverging cylindrical rigid pillars, arising from the subdorsal region of a pale green colour. When the insect is touched or alarmed from each pillar is everted a deep maroon tentacle as long as the rigid pillar, bearing at its end long party-coloured hairs, the basal third of each hair being black, the upper two-thirds white. The maroon tentacle with its long hairs spread out like a circular fan or rosette is whirled round with great rapidity in a plane parallel to the body, its use being almost certainly to frighten away its enemies, as this larva, as far as I am aware, is not attended by protecting ants, and lacks the honey-gland on the eleventh segment."

With regard to the distribution of these queer organs Brant is of opinion that whole groups of catterpillars of the family *Lycænidæ* are specified by the presence of slit and tentacles. This view, however, seems to be erroneous. Those marks are most frequently found in the group *Lycæna,* but even here we come across species in which they are wanting. The observations of Esper, Petzhold, Guenée, Moore,[2] Edwards,[3] DeNicéville,[4] etc., show that those tokens occur in the most diverse groups of the *Lycænidæ.* Some interesting accounts on the subject have been written by Mr. W. Doherty[5] and Mrs. Wylly[6].

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[1] DeNicéville, L. The Butterflies of India, Burmah and Ceylon, Vol. III, p. 288.

[2] Moore, Lepidoptera of Ceylon, Vol. I, 1881.

[3] Edwards, W. H., The Canadian Entomologist, Vol. X, 1878, and in "Butterflies of North America."

[4] DeNicéville, L., Butterflies of India, 3 vols.

[5] Journal, A. S. B., Vol. LV, pt. 2, p. 112, 1886.

[6] Journal, Bombay Nat. Hist. Soc., Vol. III, p. 164, 1888.

Viehmeyer considers the following species as myrmecophilous[1]:—

Thecla tengstrœmi, Ersch.
Rapala schistacea, Moore.
Lycæna admetus, Esp.
amanda, Schn.
arcas, Roth.
argyrognomon, Bergstr.
var. *ægidion*, Meissn.
argus, L.
arion, L.
astrarche, Bergstr.
baton, Bergstr.
bellargus, Rott.
corydon, Poda.
cyllarus, Rott.
damon, Schiff.
escheri, Hb.
eumedon, Esp.
hylas, Esp.
icarus, Rott.
jolas, O.
melanops, B.
melissa, Edw.
minimum, Fuessl.
orion, Pall.
anna, Edw.
sæpiolus, Boisd.
scudderi, Edw.
sebrus, B.
Arhopala meander, Boisd.
Zizera lysimon, Huebn.
Cyaniris argiolus, L.
,, *pseudargiolus*, Bd. and Leo.
,, *puspa*, Horsf.
Chilades lajus, Cram.
,, *trochilus*, Fr.
Lycænesthes emolus, Godt.
Catochrysops cnejus, Fabr.
,, *pandava*, Horsf.
,, *patricia*, Trim.
Polyommatus bæticus, L.
Azanus ubaldus, Cram.
Tarucus theophrastus, F.
Lampides ælianus, F.
,, *telicanus*, Lang.
Everes comyntas, Godt.
Aphnæus vulcanus, Fabr.
Jalmenus evagorus, Don.
,, *ictinus*, Hewits.
Ogyris genoveva, Hewits.
Gerydus symethus, Cram.
Castalius amanda, DeNicév.
Hypolycæna phorbas, Fabr.
Phasis aranda, Wall.
var. *mars*, Trim.

All we know about most of these caterpillars is that they live in symbiosis with the ants; but the respective species of ant is known only in a few cases. It is, therefore, important that those who collect *Lycænid* larvæ should not neglect to observe the ants that visit them and the way in which they behave towards the caterpillars, and finally to preserve a number of ants in alcohol for future identification. "Generally it is not necessary to seek far for the ants, for the nest is often to be found under the feeding plant. Also the digging out of such nests often offers a proof of the living together of caterpillars and ants. In the whole series of *Argus*-caterpillars pupation seems to take place in the nest of their visitors. Perhaps also many species hibernate in the same place. Observations on this point have not yet been published. The question of in how far the shelter ascribed to the ants really exists would be greatly explained by such observations. An especial attention should be devoted to the behaviour of the ants towards those butterflies which come out in their nests. No observations exist on the behaviour of the species of ants to those caterpillars which they do not normally visit: thus the so-called "international relations" of the *Lycænid* caterpillars should be studied in order to verify beyond doubt whether the friendship between the ants and the caterpillars is limited to certain kinds only, or whether, as in the plan-and shield-lice, it has a more international character. So far any hint or information is wanting on the phylogeny of the myrmecophilous organs, as well as an anatomical examination of these or a chemical examination of the juice which comes from them."[1]

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[1] The list is compiled from the "Entomological News," Oct. 1907, p. 380, and from notes sent to me by Mr. Viehmeyer.

In order to facilitate the detection of our caterpillars I shall add Trimen's description of the larvæ of the *Lycænidæ*: "They are shaped like wood-lice for the most part, are extremely sluggish, and look in many cases more like a coccus or some vegetable excrescence than caterpillars. Some of them are smooth, many clothed with a short down, some with fascicles of short bristles or regularly disposed tubercles, and a few hairy generally. Several are regularly corrugated dorsally, and others prominently humped in one or two places." They are usually coloured like the leaves, buds, flowers, and seed-pods on which they feed, and are for other reasons not easily seen. Most of them feed on the young leaves, buds, and flowers of trees, bushes, and low-growing plants; three genera of Indian *Lycænidæ* (*Lampides*, *Virachola*, and *Deudorix*) feed on the interior of fruits of several different species; lastly some feed upon the seed-pods of leguminous plants: these latter larvæ have very long necks, so that they can reach far into the interior of the pods with their mouths and thus scoop out the contents, while the greater portion of their body remains outside. (DeNicéville.)

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[1] Viehmeyer, l. c.

In order not to forget the practical side of these notes I venture to ask the kind help of the members in the matter. Our Society will be very thankful for any specimens of well-determined caterpillars of the *Lycænidæ*, either blown out or preserved in alcohol, formalin, etc., and for ants that have been observed in company with caterpillars or pupæ. Equally welcome are observations concerning the relations between ants and caterpillars.

BIOLOGICAL NOTES ON ORIENTAL HEMIPTERA, No. 1.

BY

J. C. KERSHAW AND G. W. KIRKALDY. *

(*With a Plate.*)

This, the first of a proposed series of biological notes on Oriental Hemiptera illustrates the metamorphoses of two widely distributed forms, *viz.*, *Dindymus sanguineus* and *Caenocoris marginatus*.

1. *Dindymus sanguineus* (Fabr.)

Pl. figs. 1*a*—5*a* and text figs. 1—4.

This belongs to the Family Pyrrhocoridæ, and is distributed from India and Ceylon to China. The examples now described were bred up from eggs taken in Macao. The metamorphoses of *Pyrrhocoris apterus* and of some species of *Dysdercus* are partly known, but not of any species of *Dindymus*.

A pair was taken in cop. on February 16th, 1907, in the evening and remained in that position till noon of March 2nd, when they separated and began to feed on house-flies. The female, with enormously distended abdomen, laid a batch of 30-40 eggs in a heap on the floor of the cage (though fresh vegetation was always kept in it) on the evening of March 5th.

The *ova* are elongate oval, without a special cap, very pale yellowish. (Pl. fig. 1*a*). They hatched on March 30th.

The first nymphal instar is pale orange with red eyes (fig. 2*a*) ; the labium (rostrum) on the first day reached only a little way beyond the thorax. A moult occurred on April 4th ; the second instar is dark orange-coloured, with little change in form. The third instar hatched on April 8th, blood-red, shining, head, thorax, &c., reddish brown, antennæ and legs brown. The fourth instar hatched April 13th, and is very similar to the preceding, but has the fourth segment of the antennæ whitish at the base. These young nymphs are very fond of Termites and suck them in preference to anything else. The fifth instar hatched on April 28th (Pl. fig. 3*a*), followed by the sixth instar on May 7th; but there was little change, except in size. The seventh instar hatched on May 14th, followed by the eighth on the 25th. In the latter the tegminal pads are well developed, reddish, as also the pronotum : head and abdomen apically blackish ; eyes dark red. Abdomen basally greenish. Pleurites chequered red and yellowish (Pl. fig. 4*a*).

In the first instar the odoriferous orifices are very minute, orange coloured. In the third they are blackish and remain so till the last. (The nymphs then died.)

Such a large number of moults in a Heteropteron is unprecedented and requires wider investigation. For the present, they may be grouped as follows : -(°) (fu). An Ethiopian Cimicid, *Bathycoelia thalassina*, has been reported by Schouteden to have 7 nymphal instars, (*cf.* Zeitschr. Wiss Insektenbiol. II. 82—8, figs. 1—9 (1906)).

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* The credit for the major part of this paper is due to Mr. Kershaw. I have merely identified the material and arranged the letter press, occasionally adding a few details. —G. W. K.

I. Orange coloured	...	Instars 1, 2
II. Blood-red	... ...	Instars 3—7 and
III. Blood-red and green	...	Instar 8

The duration of the metamorphoses was as follows :—

Copulation, February 16th to March 2nd	...	13 to 14 days.
Interval, March 2nd to 5th	... .	3 ,,
Ova laid March 5th, hatched 30th	... ...	25 ,,
Second instar hatched April 4th	... ...	5 ,,
Third ,, ,, ,, 8th	... ...	4 ,,
Fourth ,, ,, ,, 13th	... ...	5 ,,
Fifth ,, ,, ,, 28th	... ...	
Sixth ,, ,, May 7th	... ..	
Seventh ,, ,, ,, 14th	... ...	7 ,,
Eighth ,, ,, ,, 15th	... ...	11 ,,
		98 ,,

If we allow 10 days for the eighth (and probably last) to hatch out to the adult state, and 2 days for complete maturity, that gives 110 days, from copulation to copulation, or say 100 days for a complete life-cycle.

Neither in nymphal nor adult states has Dindymus any appreciable odour.

The adults and older nymphs seem entirely carnivorous, feeding on other bugs, thin-shelled snails, lepidopterous larvæ and pupæ, &c. Mr. Kershaw has also seen an adult, with its setæ thrust into the hard ootheca of the Mantid *Hierodula saussurei*, W. F. Kirby. In feeding, the bug often sucks without using the labium at all ! In this case the bug constantly thrusts the seta in and out of the body of its prey.

The following text figure illustrates some of the methods of using the labium while feeding. :—

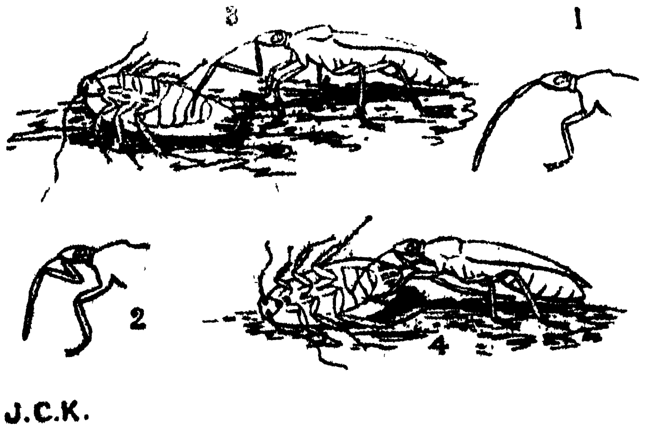


Fig. 1. *Dindymus sanguineus* sucking a cockroach, setæ wholly within the labium.

Fig. 2. The same at another time, the labium acutely angled, setæ partly exposed.

Fig. 3. The same with the setæ uncovered between the angles of the labium.

Fig. 4. The bug using the setæ without the guidance of the labium.

2. *Caenocoris marginatus* (Thunberg.)

Pl. figs, 1—7.

This form belongs to the Myodochidæ (or " Lygaidæ " of some authors) and has much the same geographical distribution as the *Dindymus* and is also without any offensive smell. The only near ally of which the metamorphoses are fairly known is the American *Stalagmostethus turcicus*. The eggs observed were deposited about the middle of December.

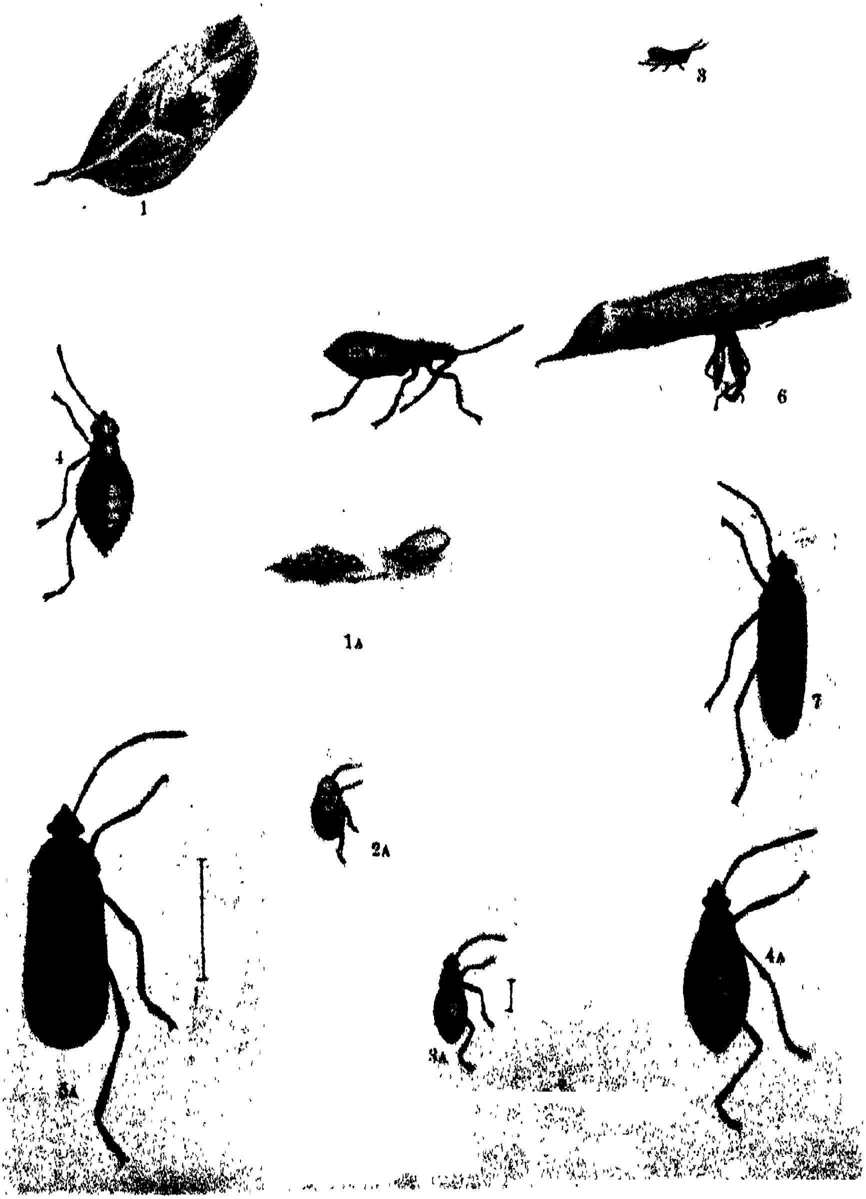
The period from hatching to maturity was fifty-three days ; in wet seasons it is perhaps much less. The exact number of moults was not observed.

The *ova* are deposited on the upper side of a leaf in a semi-circular batch of about twenty, touching one another. When first laid they are pale yellowish-red, deepening to blood-red, the caps white (Pl. fig. 1-2) the entire egg usually splits longitudinally, though sometimes the upper part of the shell breaks transversely some distance below the cap. *Nymphal instars.*—When first hatched the nymphs are blood-red, antennæ and legs brownish. Abdomen almost globular in section. They feed on vegetable juices, especially *Toxocarpus wightianus*, Hook. and Arn., a twiner very common in South China. The labium reaches to about the middle of the abdomen, gradually lengthening and reaching beyond the apex in much about a week. The bug is less globular in section, when about one-fourth of an inch long, the legs and labium being black, the latter again reaching only to the middle of the abdomen (Pl. fig. 3.) When about four weeks old, the tegminal pads are reddish-brown and fairly distinct (Pl. fig. 4-5). At five weeks they are black.

To facilitate the final moult, the bug hangs from a twig, and occasionally brings the hind legs over the back, scraping them down the tegmina towards the pearly white membrane (fig. 6). In about three hours after this moult is accomplished the membrane becomes dark smoky, and the red colour of the other parts darkens. In about eight hours the change of colour is complete (fig. 7).

EXPLANATION OF PLATE.

Fig. 1*a*.	... ...	*Dindymus sanguineus*, ova.
„ 2*a*.	... ...	First nymphal instar.
„ 3*a*.	... ...	Fifth nymphal instar.
„ 4*a*.	... ...	Eighth nymphal instar.
„ 5*a*.	.. ...	Adult.
„ 1.	... ...	*Caenocoris marginatus*, ova.
„ 2.	... ...	The same, enlarged.
„ 3.	... ...	First (?) nymphal instar (about a week old).
„ 4.	... ...	A later instar (about four weeks old).
„ 5.	... ...	The same in profile.
„ 6.	... ...	Newly emerged adult.
„ 7.	... ...	Adult with matured colouring.



ORIENTAL HEMIPTERA.

Fig. 1. to 7. *CAENOCORIS MARGINATUS.* Fig. 1A to 5A. *DINDYMUS SANGUINEUS.*

THE FERNS OF THE BOMBAY PRESIDENCY.

BY

E. BLATTER, S.J.

It is strange that the ferns, though being distinguished by an infinite variety in the form and division of their leaves and the elegant beauty of their whole appearance, received so little attention in the Bombay Presidency on the part of botanists as well as of amateurs. An explanation of the fact may be found in the circumstance that just near the centres of human commerce in the Presidency the fern vegetation is very scanty or almost nil. Other parts with a rich growth of ferns are inaccessible for most of us during the four rainy months of the year, when plant-life is at its best. A second reason might be the difficulty that is generally experienced in the identification of the members of this class of plants. The consequence is that the botanical literature regarding our ferns is not a rich one. Of those that wrote expressely on the Flora of the Presidency, Graham[1] is the first to give some information on the cryptogamic vegetation. He mentions 25 species of ferns with notes as to the places where they had been collected. Dalzell and Gibson[2] did not add anything to the knowledge of the cryptogams. We read in the preface to their "Bombay Flora": "The Cryptogamic portion of the catalogue has, in order to meet the present wants of our readers, been literally transcribed from that of Mr. Graham, but we hope on a future opportunity to be able to present it to the public in a more compact and enlarged form." Whether their hope was over realized I am not able to say; at least I could not find any further publication on the subject by either of the two botanists. In 1886, H. M. Birdwood[3] wrote a catalogue of the Flora of Matheran in which he enumerates 12 species of ferns as growing in that place. In 1887[4], he published a catalogue of the Flora of Mahableshwar and Matheran, mentioning 14 species as occurring in both places. In a final revision of the same catalogue in 1897 the species of ferns found at Mahableswar and Matheran[1] amount to 32. The latest and at the same time the richest contribution towards the knowledge of the fern-vegetation of the Bombay Presidency is contained in Vol. V of our Journal, where T. R. M. Macpherson[2] gives a list of 75 species gathered in North Kanara. Reference is sometimes made to the Bombay-ferns in W. Hooker's "Species Filicum" and "Synopsis Filicum", of Smith's "Historia Filicum," R. H. Beddome's "Ferns of Southern India," "The Ferns of British India," and especially in his "Handbook to the Ferns of British India, Ceylon and the Malay Peninsula." Here I must not forget to mention Gray who, in his treatise on the "Botany of the Bombay Presidency,"[3] mentions about 50 species of Ferns.

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[1] J. Graham: Catalogue of the Plants growing in Bombay and its Vicinity, 1839.

[2] A. Dalzell and A. Gibson: The Bombay Flora, Bombay, 1861.

[3] H. M. Birdwood: A Catalogue of the Flora of Matheran; in B. N. H. Journal Vol. I, p. 203.

[4] H. M. Birdwood: A Catalogue of the Flora of Mahableshwar and Matheran; in Journal, B. N. H. S., Vol. II, p. 107.

Of the species enumerated in the catalogue I was able to verify all, except Nos. 108, 109, and 110, which have been received into the list on the authority of Gray. Through the kindness of Mr. Gammie I had access to the Herbarium of the Economic Botanist at Kirkee. Most of its specimens belong to other parts of the Bombay Presidency than North Kanara. The collections of the B. N. H. S. cover a greater area. Macpherson's herbarium supplements that at Kirkee as it contains exclusively specimens from North Kanara. Another collection, by Woodrow, consists chiefly of species gathered at Mahableshwar, Matheran, and in the Southern Mahratta Country. The Herbarium of St. Xavier's College contains specimens collected in the Konkan, on the Ghats, and in the Poona district.

In the "Note" to the "Flora of the Presidency of Bombay" Cooke says: "A difficulty which occurs in the preparatian of a local flora is the want, in many cases, of information as to the precise localities in which specimens have been collected. The older botanists, Stocks, Dalzell, Law, etc., who collected in the Presidency, rarely furnished more definite localities than Konkan, Deccan, Sind and the like." I, for my part, have no reasons to make the same complaint. Nearly all the specimens I have seen are well ticketed, and only in a few cases I had to be satisfied with a more general information as to the locality of a species The material that was at my disposal cannot, of course, be compared with that of the great botanical centres of Europe, but being of comparatively recent origin, it is distinguished just by that advantage which is very often missing in old collections, *viz.*, accurate data as to the habitat of the species.

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[1] H. M. Birdwood: A Catalogue of the Flora of Mahableshwar and Matheran; in Journal, B. N. H. S., Vol. X, p. 394.

[2] T. R. M. Macpherson: List of Ferns gathered in North Kanara; in Journal, B. N. H. S Vol. V, 375.

[3] W. Gray. The Botany of the Bombay Presidency; in Bombay Gazetteer, Vol. XXV

In order to facilitate the ready formation of a general idea regarding the plant-geographical position of our Fern-Flora I shall add to each species its distribution in the Indian and Extra-Indian regions, as given in Beddome's "Handbook." For practical reasons I shall follow the nomenclature and classification as laid down in the same work, though the modern treatment of the subject would recommend a good many changes.

As regards the *Rhizocarpeæ* (*Marsileaceæ* and *Salviniaceæ*) I am not able to give any reliable information, as the Herbaria contain no specimens belonging to either of these Orders. Dalzell and Gibson mention three species: *Marsilea quadrifoliata*, *Isoëtes coromandelina*, and *Salvinia cucullata*, but no habitat is given. I can scarcely believe that so many industrious collectors and able botanists that visited the different parts of the Presidency entirely overlooked these interesting plants, and I feel sure that the European Herbaria are able to supply the necessary materials.

FILICINEÆ.

I.—GLEICHENIACEÆ.

1. *Gleichenia linearis* (Burm.) N. Kanara: above ghats: Tyagli, Yellapur, Bareh, Idagoongi, Nuji, Sumkund, Nilkund, Sirsi, Jog, Hoolgeri, Harshikuta; below ghats: Herigooti, Katgal, Honswur, Kasurgode, Bhatkal, Hebunkerri; perennial, climbing to a good height over banks, (Macpherson); Southern Mahratta Country: Castle Rock (Gammie); Konkan (Gray).—Mountains of Southern India and Ceylon, up to 6,000 feet; Sikkim; Bhotan; Nepal; Kumaon; Khasya, etc., up to 5,000 feet; Malay Peninsula.—Japan; Tropical Australia; America; Polynesia.

II.—POLYPODIACEÆ.

1.—Cyatheæ.

2. *Cyathea spinulosa*, (Wall.) N. Kanara: above ghats: Anmode, Cooesi, Hoolgeri; a tall tree fern, caudex 10-15 feet, in damp shady places, (Macpherson).—Wynaad at 3,000 feet; South Kanara; Coorg; Jeypore Hill; Nepal; Jaintea Hills.

3. *Alsophila latebrosa*, (Hook.) N. Kanara: above ghats; a lofty tree fern, (Macpherson).—Nilgiris and all the Western mountains of the Madras Presi-

dency and the Shevaroys, up to 7,000 feet; Sikkim; Bhotan; Khasya 3,500—5,000 feet; Malay Peninsula; Penang.

4. *Alsophila glabra*, (Hook.) N. Kanara: above ghats: Jog, Bareh, Idagoongi, Anmode, Cooesi, Kumbarwada, Devimunni, Sumkund, Nilkund, Sirsi, Tyagli, Hoolgeri, Munchekerri, Harshikuta; below ghats: Katgal, Yan. A tree fern found in moist shady places, (Macpherson).—Western hills of the Madras Presidency up to 4,000 feet: North Arcot and Cuddapa Hills; Jeypore; Himalayas, very common in Sikkim, Nepal, etc.; Burma and Ceylon.

2.—Dicksonieæ.

5. *Peranema cyatheoides* (Don.) In moist shady places at Mahableshwar scarce, (Gray).—Nepal and Bhotan, 6,000—10,000 feet; Khasya, 4,500—6,000 feet; Anamallays, 6,000 feet.

3.—Hymenophylleæ.

6. *Hymenophyllum polyanthos*, (Sw.) S. Mahratta Country: Castle Rock (Gammie).—Western Ghats of the Madras Presidency; Ceylon; Himalayas and Khasya mountains, 1,000—12,000 feet; Burma.

7. *Trichomanes kurzii*, (Bedd.) N. Kanara: above ghats: Godhulli, Anshi ghat, at no great elevation. Found on moist trunks of trees during the monsoon, (Macpherson).—Malabar, foot of the Tambacherry ghat: Assam; Andaman Islands.

8. *Trichomanes intramarginale*, (Hook & Grev.) N. Kanara: above ghats: Devimunni. On moist rocks and ground in shady places by the banks of streams, (Macpherson).—Malabar plains, foot of the Bhagamandal ghat which descends from Coorg; Ceylon, in the Ambagamwa district: Sivagari Hills (Tinnevelly district).

9. *Trichomanes bipunctatum*, (Poir.) Western forests of the Presidency, (Beddome).—Western forests of the Madras Presidency, up to 8,000 feet: Ceylon; Himalayas and Khasya hills, up to 6,000 feet.—Throughout the tropics of the whole world.

4.—Davallieæ.

10. *Leucostegia immersa*, (Wall.) Mahableshwar, on trees and banks, (Birdwood and Cooke).—Madras Presidency on the Western mountains; Coorg; Himalayas, from Mussorie to Bhotan, 3,000—6,000 feet; Sikkim: Khasya; Malay Peninsula.—Java.

11. *Leucostegia pulchra*, (Don.) Mahableshwar, on trees, (Birdwood). Madras Presidency on the Western mountains; Ceylon, Central Provinces 3,000—5,000 feet; Himalayas; Nepal; Bhotan, 2,000—9,000 feet; Khasya; Moulmein.

12. *Davallia bullata*, (Wall.) Western Ghats of the Presidency, (Beddome).—Western Ghats of the Madras Presidency; Himalayas, Nepal to Bhotan, 2,000—6,000 feet; Khasya; Ceylon; Burma; Malay Peninsula.—Japan; South China; Malay Islands.

13. *Microlepia speluncæ*, (L.) N. Kanara: above ghats: Jog; below ghats: Yan. Frond found at Jog 7′-9″ long, 3′-3″ broad, (Macpherson).—Western mountains of Madras Presidency; Ceylon; Himalayas from Kumaon east-

wards : Khasya ; Chittagong : Malay Peninsula.—China ; Japan ; Malay Islands · Polynesia ; Tropical America.

14. *Microlepia spelunca*, (L.) var, *rhomboidea*, N. Kanara, (Macpherson).—Very common throughout India and Ceylon.

15. *Stenoloma chinensis*, (Swartz.) N. Kanara: above ghats: Sumkund, Tyagli, Nilkund, Hoolgeri, Harshikuta, (Macpherson).—Madras Presidency, Western mountains, 3,000—6,000 feet; Himalayas, Kumaon to Bhotan; Khasya; Ceylon ; Malay Peninsula.—China, Japan, Polynesia, East African Islands.

5.—*Lindsayeæ.*

16. *Schizoloma lobata*, (Poir.) North Kanara : above ghats : Jog, (Macpherson).—Malabar and Travancore mountains ; Ceylon.—Queensland ; Polynesian Islands.

17. *Schizoloma ensifolia*, (Swartz.) N. Kanara : above ghats : Idagoongi, Nuji, Anshi, Devimunni, Sumkund, Nilkund, Hoolgeri ; below ghats : Herigooti, Katgal, Honawur, Kasurgode, Bhatkal, (Macpherson) .—Deccan : Mahableshwar, (Birdwood).—Western mountains of Madras ; Ceylon ; Himalayas, Sikkim to Muneypore and Chittagong up to 4,000 feet ; Burma.—North Australia, Tropical Africa ; East African Islands ; Polynesia.

18. *Schizoloma heterophylla* , (Dry.) North Kanara : Very common above and below ghats. Fronds occasionally tripinnatifid. Specimen found at Sirsi tripinnate as in *Lindsaya heterophylla* (Macpherson).—Malabar mountains, Travancore ; Ceylon ; Malay Peninsula.—Mauritius ; Hong-kong ; Malay Islands.

6.—*Pterideæ.*

19. *Adiantum lunulatum*, (Burm.) North Kanara : Common above and below ghats during the rains, dying down shortly after, (Macpherson) ; Goa territory, pretty common, (Dalgado) ; Deccan : Mahableshwar, (Birdwood.) Lonavli, (Gammie) ; Khandala, (Blatter) ; Konkan : Matheran, (Birdwood.) Throughout Northern India in moist places ; South India : general on the western side in the plains and lower slopes of the hills ; Ceylon ; Burma.—In the tropics of nearly the whole world.

20. *Adiantum capillus veneris* , (L.) Deccan : Panchgani, on wet rocks, (Birdwood) ; under sheltered banks near water-courses in the Deccan, Khandesh, Gujarat, Sind, (Gray).—Madras Presidency, west side, common on banks of rivers in the plains, and up to 5,000 feet ; Ceylon ; North India.—Europe ; Africa ; America ; Australia.

21. *Adiantum caudatum*, (L.) Southern parts of the Presidency in the higher ghats, (Gray).—Throughout India, Ceylon and the Malay Peninsula, in the plains and on lower slopes of the hills.—South China ; Malay Islands ; Java ; Mauritius ; Tropical Africa , Cape Verde Islands.

22. *Adiantum æthiopicum*, (L.) N. Kanara : above ghats : Supa, rare (Macpherson).—Nilgiri and Pulney mountains at the higher elevations ; Ceylon.—Australia ; New Zealand ; America ; Africa ; East African Islands.

23. *Cheilanthes farinosa*, (Kaulf.) N. Kanara: above ghats: Nidgod, dying down shortly after the rains, (Macpherson); Deccan: Mahableshwar, Panchgani, (Birdwood); Sakar Pathar, Purandhar Fort (Cooke); Lonavli (Gammie); Khandala (Blatter); Konkan: Matheran (Birdwood). The Copper-fern variety at Pertabgarh.

24. *Cheilanthes tenuifolia*, (Sw.) North Kanara. Common everywhere during the rains, dying down shortly after, (Macpherson): Deccan: dry localities, (Gray); Londa on clay banks (Woodrow.)—Madras Presidency, common in the plains and on low hills up to 4,000 feet; Bengal; Assam; Chittagong; Dacca: Chota Nagpur; Khasya up to 3,500 feet: Sikkim; Malay Peninsula.—China; Australia; New Zealand; Polynesia; Uruguay; Malay Islands.

25. *Pteris longifolia* (L.) N. Kanara: above ghats: Supa, Arbail ghat, Anshi; below ghats: Yan, (Macpherson); Southern Mahratta Country: Castle Rock, (Woodrow); Konkan: below Mahableshwar, (Birdwood).—Madras Presidency; Bengal, in the plains and up to 5,000 feet; Ceylon: Burma.—Widely distributed over the whole world.

26. *Pteris pellucida*, (Presl.) N. Kanara: very common everywhere; a variety with broad white bands down the centre of the pinnæ is found on the Anshi and Nilkund ghats, (Macpherson); Southern Mahratta Country: Castle Rock, (Woodrow); Deccan: Mahableshwar, (Birdwood).—Western forests of Madras Presidency; plains and hills of Bengal up to 3,000 feet elevation.—Malay Islands; Guinea Coast.

27. *Pteris quadriaurita*, (Retz.) N. Kanara: below ghats, common above ghats, (Macpherson). Southern Mahratta Country: Castle Rock, (Woodrow). Amboli Ghat. Deccan: Mahableshwar, (Birdwood); Konkan: Danoli, (Woodrow), Matheran; (Birdwood).—Throughout India, Ceylon, and the Malay Peninsula, from the plains up to 8,000 feet.—All round the world throughout the tropics and a little beyond them.

28. *Pteris quadriaurita*, (Retz.) var. *setigera*. N. Kanara, (Macpherson).—Coorg and Malabar.

29. *Pteris aquilina*, (L.) N. Kanara: common on the crest of the ghats in dry places, (Macpherson), Deccan: Mahableshwar (Birdwood), Panchgani, Sakar Pathar, (Woodrow), Khandala (Cooke); Konkan: Matheran, (Birdwood).—Throughout India, Ceylon, and the Malay Peninsula on the mountains, 2,000—8,000 feet.—Throughout the whole world, except the Arctic zones and temperate South America.

30. *Campteria biaurita*, (L.) North Kanara: above ghats: Jog, Supa Jugelpet, Anmode, Kumbarwada, Anshi, Devimunni, Idagoongi, (Macpherson). Mahableshwar, (Birdwood). Panchgani, (Cooke).—Madras Presidency, western parts up to 6,000 feet; Northern India from the plains up to 6,000 feet; Ceylon; Malay Peninsula.—Malay Islands; China, Australia; tropical Africa.

31. *Ceratopteris thalictroides*, (L.) North Kanara: below and above ghats, common in tanks and streams, in swampy ground and even rice fields in the

rains ; a perennial in favourable situations, (Macpherson). Londa, (Woodrow).—Throughout India, Ceylon, and the Malay Peninsula up to 3,000 feet elevation.—In the tropics of the whole world.

7.—*Blechneæ.*

32. *Blechnum orientale*, (L.) N. Kanara : very common above and below ghats, (Macpherson). Southern Mahratta Country : Castle Rock (Cooke). Deccan : Mahableshwar, (Birdwood), Konkan, (Gray).—Throughout India, Ceylon, and the Malay Peninsula.—Malay Islands ; China ; Polynesia ; Australia.

8.—*Asplenieæ.*

33. *Thamnopteris nidus*, (L.) var. *phyllitidis*, (Don.) N. Kanara : above ghats : Jog, Kansar, Nilkund, Tyagli. Growing on trees, (Macpherson).—Western forests of the Madras Presidency, very common , Himalayas ; Khasya , Malay Peninsula,—Java ; Luzon ; Samar.

34. *Asplenium lunulatum*, (Sw.) N. Kanara : above ghats : Nilkund (Macpherson).—Nilgiris ; Anamallays.

35. *Asplenium lunulatum*, (Sw.) var. *trapeziforme*. (Roxb.) Mahableshwar (Birdwood) ; Panchgani (Woodrow).—Nilgiris , Anamallays.

36. *Asplenium falcatum*, (Lam.) N. Kanara : above ghats : Yekambi (Macpherson) ; Savantvadi (Dalgado) , Mahableshwar (Birdwood).—Madras Presidency, Western mountains ; Ceylon ; Malay Peninsula ; Soonderbun ; Koolna in Jessore.—Australia ; S. Africa and its islands ; Polynesia.

37. *Asplenium macrophyllum*, (Swartz.) N. Kanara (Macpherson).—Madras Presidency, Western mountains ; Ceylon ; Malay Peninsula.—Australia ; S. Africa ; Polynesia.

38. *Asplenium unilaterale*, (Lam.) Panchgani (Birdwood).—Madras Presidency, in all the Western forests up to 5,000 feet. Himalayas from Chamba to Bhotan, 1,000—5,000 feet ; eastward of Nepal ; Chittagong ; Ceylon ; Malay Peninsula.—Malay Islands , Polynesia ; Japan ; Tropical Africa.

39. *Asplenium unilaterale*, (Lam.) var. *rivale*, (Bedd.) N. Kanara : above ghats : Nilkund, Yan, Malimani, (Macpherson).—Pulney Hills and Anamallays, only in river beds.

40. *Asplenium unilaterale*, (Lam.) var. *udum* (Atkinson). N. Kanara : above ghats : Anmode ; Cooesi, (Macpherson).—Himalayas ; Dalhousie, 5,500 feet elevation ; pendant from dripping rocks.

41. *Asplenium laciniatum*, (Don.) N. Kanara : above ghats : Anshi, Yekambi, (Macpherson) ; Mahableshwar and Matheran, (Birdwood).—Madras Presidency, all the Western mountains, 3,000—8,000 feet ; Himalayas, Gurwhal to Bhotan ; Khasya ; Ceylon.—Japan.

42. *Athyrium hohenackerianum*, (Kze.) N. Kanara : above ghats, below ghats common during the rains, (Macpherson), Sind (Beddome).—Madras Presidency in the Western forests, from the plains up to 4,000 feet ; Ceylon.

43. *Athyrium macrocarpum*, (Blume.) N. Kanara : above ghats. (Macpherson).—South India, very common on the Western mountains, above 3,000 feet ;

Ceylon ; Himalayas, Gurwhal to Bhotan, 2,000—9,000 feet ; Khasya ; Burma ; Malay Peninsula.—Malay Islands ; China ; Japan.

44. *Athyrium gymnogrammoides* (Kl.) Mahableshwar (Birdwood). —Ceylon ; Central Provinces, 5,000—6,000 feet.

45. *Athyrium filix-fœmina*, (Bernh.) var. *pectinata*, (Wall.) Mahableshwar (Birdwood); Sind (Beddome).—Himalayas, Sikkim to Gurwhal, 2,000—5,000 feet ; Parasnath, 4,000—5,000 feet ; mountains of the Godavary and Central India ; Mount Abu.

46. *Athyrium filix-fœmina*, (Bernh.) var. *flabellulata*, (Clarke). Mahableshwar (Birdwood).—Sikkim, 13,000 feet ; Yakla ; Jongri.

47. *Athyrium falcatum*, (Bedd.) Mahableshwar (Beddome).—South India, Anamallay Hills, dry grassy places 5,000 feet ; Myhenda Hill near Berhampore, 4,500 feet ; Parasnath, 4,000 feet.

48. *Diplazium asperum*, (Bl.) N. Kanara : above ghats : Supa, Sirsi, Tyagli Jog, (Macpherson).—Madras Presidency, throughout the Western forests, from no elevation up to 3,000 feet ; Cuddapa forests ; Sikkim ; banks of the Teesta.—Java.

49. *Diplazium latifolium*, (Don.) N. Kanara : above ghats : Tyagli, Hoolgeri, (Macpherson).—Madras Presidency, in all the Western forests ; North India, throughout the Himalayas and Khasya Hills ; Ceylon ; Malay Peninsula. —Australia ; China ; Philippines.

50. *Anisogonium esculentum*, (Presl.) N. Kanara : Above ghats : Jog, Kygaghat, Barch. Idagoongi, Supa, Chandwadi, Anmode, Cooesi, Devimupni, Sum kund, Tyagli ; below ghats : Kadra, Katgal ; growing on the banks of streams, (Macpherson) ; Mahableshwar (Birdwood and Cooke).—South India, common in the plains on the Western side and up to 3,000 feet ; Bengal Plains ; Ceylon : Malay Peninsula.—China ; Formosa ; Malay Islands.

51. *Allantodia javanica*, (Bl.) Kanara ; in moist places along the ghats, (Gray).—Nepal and Bhotan, 4,000—7,000 feet ; Khasya, Mikir Hills ; Ceylon.—Java ; Samoa.

52. *Actinopteris dichotoma*, (Forsk.) Deccan : Khandala ghat on Mahableshwar road, (Birdwood) ; Kartraj ghat near Poona, Parvati Hills, (Blatter) ; Patas, Chakan, Purandhar Fort, Shivapur to Nasrapa, (Cooke). Generally on rocks and old walls.—Throughout India, especially the Peninsula below 3,000 feet ; Ceylon.—North Africa ; Mascareen Islands ; Persia ; Cabul.

9. *Aspidieæ.*

53. *Mesochlæna polycarpa*, (Bl.) N. Kanara : below ghats (Macpherson).—Malay Peninsula.—Malay Islands.

54. *Polystichum auriculatum*, (L.) Ghats of the Southern Presidency, (Gray).—Throughout India and Ceylon.—Formosa.

55. *Polystichum aculeatum*, (Sw.) Ghats of the Southern Presidency, (Gray).—Throughout India on the mountains.—Throughout the whole world.

56. *Aspidium subtriphyllum*, (Hook.) N. Kanara : above ghats : Malimani, (Macpherson).—Ceylon ; Malay Peninsula.

57. *Aspidium polymorphum*, (Wall.) N. Kanara: above ghats: Malimani, Jog, Anmode, Cooesi, Supa, Nilkund, Sirsi, Tyagli, (Macpherson). Deccan: Mahableshwar, (Birdwood); along the higher ghats, (Gray).—Madras Presidency, western forests up to 4,000 feet; Northern India from Gurwhal to Mishmee and Chittagong; Burma; Ceylon.—Malay Islands; Philippines; Fernando Po

58. *Aspidium cicutarium*, (Sw.) N. Kanara: common below ghats, very common above ghats, (Macpherson). Southern Mahratta Country: Castle Rock, (Gammie): Deccan: Mahableshwar, (Birdwood), in the shady ghat jungles, (Gray), Khandala, (Blatter); Konkan: Matheran, (Birdwood). Throughout India, from the plains up to 5,000 feet.—In the tropics throughout the world.

59. *Aspidium multicaudatum*, (Wall.) N. Kanara: above ghats; Nilkund, (Macpherson).—Khasya Hills, south side up to 1,000 feet elevation: Burma; Anamallay forests?

60. *Pleocnema membranifolia*, (Presl.) N. Kanara: above ghats: Nilkund, Sirsi, Tyagli, Jog, Hoolgeri; below ghats: Katgal, Hebunkerri, Yan, (Macpherson).—East Bengal Plains, extending into Assam, Cachar, and Chittagong; Khasya and Sikkim Hills up to 3,000 feet elevation; Burma; Malay Peninsula.

61. *Lastrea calcarata*, (Bl.) var. *ciliata*, (Wall.) N. Kanara: above ghats: Anmode, Cooesi; growing on moist rocks and by the banks of streams, (Macpherson).—Southern India, very common in all the Western forests, Ceylon; Khasya; Himalayas; Burma.

62. *Lastrea syrmatica*, (Willd.) N. Kanara: above ghats: Anmode, (Macpherson). South India, not common; Carcoor ghat, 2,000—2,500 feet; Anamallays and Travancore Hills; Ceylon; forests of the Central Provinces. North India, Sikkim, Assam, Khasya; Burma; Malay Peninsula.—Philippines.

63. *Lastrea filix-mas*, (L.) var. *elongata*, (Hook. and Grev.) Deccan: Mahableshwar (Birdwood and Cooke). Southern India, on the Western mountains, 4,000—6,000 feet; Ceylon; Himalayas and Khasya, 5,000—9,000 feet.

64. *Lastrea filix-mas*, (L.) var. *cochleata*, (Don.) N. Kanara: Anshi ghat, (Macpherson); Deccan: Mahableshwar, (Birdwood and Cooke).—Southern India, Western mountains 2,000—4,000 feet; North India up to 4,000 feet; Malay Peninsula.

65. *Lastrea dissecta*, (Forsk.) N. Kanara: Bilgi, near Menshi, (Macpherson).—Madras Presidency, Western mountains, common up to about 5,000 feet, North Arcot and Vizagapatam Hills; Ceylon, up to 5,000 feet; Burma.—Malay Islands; Polynesia.

66. *Lastrea tenericaulis*, (Wall.) N. Kanara, (Macpherson).—South India, on the Western mountains, 2,000—3,000 feet; Ceylon, 1,500—3,000 feet; North India, Himalayas from no great elevation up to 4,000 feet; Malay Peninsula.—China; Australia; Polynesia.

67. *Lastrea crenata*, (Forsk.) Western Ghats, (Woodrow).—South India, on the Anamallays, Peringoonda Hill, 5,000 feet; Ceylon; Himalayas from Gurwhal to Bhotan, 2,000—7,000 feet; Khasya, 2,000—4,500 feet; Chota Nagpur, 2,000—3,000 feet; Malay Peninsula.—South China; Mauritius; tropical Africa.

68. *Lastrea odontoloma*, (Moore.) Mahableshwar: at Kate's Point and along the crest of the hill on the way to Panchgani, (Birdwood).—Himalayas, Chamba to Bhotan, 11,000—16,000 feet elevation.

69. *Lastrea sparsa*, (Don.) Mahableshwar: on the Yenna near the falls, (Birdwood).—South India, on all the Western mountains and on the hills on the East side; Ceylon; Himalayas and Khasya, 2,000—6,000 feet; Burma: Malay Peninsula.—Malay Islands; China; Mauritius.

70. *Nephrodium unitum*, (L.) N. Kanara: above ghats: Anmode, Samzode, Sirsi; below ghats: Katgal, Hebunderri; growing in swampy places and tanks, (Macpherson).—Throughout the Indian region in swampy places.—Tropical Asia, Africa, Australia and America.

71. *Nephrodium pteroides*, (Retz.) N. Kanara: above ghats: Kumbarwada, Anshi, Nilkund, Sirsi, Ekambi, Munchekerri, Tyagli; below ghats: Katgal. Growing in dry shady places in evergreen jungle, (Macpherson).—Madras Presidency, Western mountains, 2,000—4,000 feet; Ceylon, up to 3,000 feet; Burma.—Philippines.

72. *Nephrodium extensum*, (Bl.) N. Kanara: above ghats: Sirsi, Munchekerri. Growing in swampy places (Macpherson).—South India, Tinnevelly Hills; Ceylon; Central Provinces, 3,000—4,000 feet; Burma; Penang; Malay Peninsula.—Malay Islands.

73. *Nephrodium pennigerum*, (Bl.) N. Kanara: above ghats: Tyagli, Jog; below ghats: Yan, Mankibile (Macpherson).—South India, in all the Western mountain forests; Ceylon, Central Provinces, 2,000—4,000 feet; East Bengal, from Mishmee to Chittagong, at no great elevation; Malay Peninsula.—Malay Islands; Tropical Africa.

74. *Nephrodium molle*, (Desv.) N. Kanara: below ghats; common above ghats, (Macpherson).—Castle Rock (Woodrow). Mahableshwar, (Birdwood).—Throughout the Indian region from the plains up to 6,000 feet.—All over the world in tropical and sub-tropical regions.

75. *Nephrodium crinipes*, (Hook.) North Kanara: above ghats: Jog; below ghats: Katgal. Growing in swampy places (Macpherson).—Malacca, North-East Bengal, up to 1,500 feet, from Nepal to Assam and Chittagong.

76. *Nephrodium truncatum*, (Presl.) N. Kanara: above and below ghats (Macpherson).—South India, Tinnevelly and Travancore Hills; Ceylon; Central Provinces, 2,000—5,000 feet; Cachar and Chittagong Hills at no elevation; Malay Peninsula.—Malay Islands; North Australia; Polynesia.

77. *Nephrolepis cordifolia*, (L.) North Kanara: above ghats: Ekambi. Perennial; specimens found growing on the top of *Caryota urens*, Willd. (Macpherson.) Mahableshwar on trees, (Birdwood). Panchgani, (Woodrow).—Throughout India up to 5,000 feet.—Japan; New Zealand; tropics of the whole world.

78. *Nephrolepis exaltata*, (L.) N. Kanara: above ghats: Jog, Kyga ghat, Sumkund, Sirsi, Tyagli, Hoolgeri; below ghats: Honawur, Kasurgode. Specimen found at Kasurgode nearly 6 feet long, (Macpherson).—South India,

mountain forests of the Eastern and Western sides; East Bengal from Assam to Chittagong, up to 1,000 feet; Ceylon; Malay Peninsula.—In the tropics of nearly the whole world.

79. *Nephrolepis acuta*, (Presl.) N. Kanara: above ghats: Supa; pendent from dripping rocks, (Macpherson).—South India, on the North Arcot Hill at no great elevation; Ceylon; North India, Chittagong Hills up to 1,000 feet.—Tropical Africa.

80. *Nephrolepis ramosa*, (Beauv.) N. Kanara: below ghats: Karwar, Anshi ghat at no elevation. Annual, dying down after the rains, (Macpherson).—Ceylon, Central Provinces, 2,000—5,000 feet, climbing on trees; Malay Peninsula.—Tropical Africa; Philippines; Australia; Fiji.

10. Polypodieæ.

81. *Phegopteris ornata*, (Wall.) North Kanara: above ghats, (Macpherson).—South India, Carcoor ghat, Malabar and elsewhere along the Western ghats; Himalayas, from Kumaon to Bhotan, in tropical valleys up to 2,000 feet; Chittagong Hills, 500 feet; Malay Peninsula.—North Australia; Polynesia.

82. *Goniopteris prolifera* (Roxb.) N. Kanara: above ghats: Jog, Birchi Supa, Anmode; below ghats: Kadra, Growing in the beds of rivers, (Macpherson).—Konkan (Gray).—Throughout the Indian region in the plains or low down in the hills.—North Australia; Tropical and South Africa and its islands; Philippines; New Caledonia; South China.

83. *Niphobolus adnascens* (Sw.) N. Kanara: below ghats and above ghats, common on trees and rocks, (Macpherson); Konkan jungles (Gray); Goa and Sawantvadi (Dalgado).—Throughout India from the plains up to 4,500 feet; Ceylon; Malay Peninsula.—China; Fiji; Mascareen Islands; Cameroon Mountains.

84. *Drynaria quercifolia*, (L.) N. Kanara: above and below ghats. Common during the rains on trees and rocks, (Macpherson). Goa and Sawantwadi (Dalgado); Konkan on trees, (Gray); Matheran, (Birdwood): Deccan; Mahableshwar, (Birdwood).—Throughout the Indian region in the plains or low down on the mountains.

85. *Pleopeltis linearis*, (Thunb.) N. Kanara: above ghats, (Macpherson). Southern Mahratta Country: Castle Rock, (Woodrow). Konkan jungles, (Gray). Deccan: Mahableshwar (Birdwood).—Himalays, 1,000—10,000 feet: Khasya; throughout South India; Ceylon; Malay Peninsula.—Malay Islands: China; Japan; Central and South Africa and its Islands.

86. *Pleopeltis simplex*, (Sw.) N. Kanara: above ghats, (Macpherson).—Himalayas.

87. *Pleopeltis lanceolata*, (L.) N. Kanara: Yan, (Macpherson).—Nilgiris and higher mountains on the west side of the Madras Presidency; Assam; Ceylon, Ambawalla estate.—Tropical America; West Indies; South Africa and its Islands; St. Helena; Sandwich Islands.

88. *Pleopeltis membranacea*, (Don.) N. Kanara: Godhullie, (Macpherson). Konkan jungles, (Gray). Deccan: Mahableshwar, (Birdwood); Lonavli,

(Woodrow); Khandala, (Cooke).—Himalayas, from Gurwhal to Bhotan, 3,000—8,000 feet; Khasya, 2,000—5,000 feet; Chota Nagpur, Parasnath; South India, mountains on both sides of the Madras Presidency, 2,000—5,000 feet; Ceylon.

89. *Pleopeltis punctata*, (L.) N. Kanara: above ghats: Tyagli, Kansur, (Macpherson).—South India, Western mountains up to 3,000 feet; Ceylon; North India, in the Bengal plains and up to 3,000 feet; Malay Peninsula.—China; Malay Islands: North Australia; Polynesia; Southern and Central Africa and its Islands.

11. Grammitideæ.

90. *Gymnogramme leptophylla*, (Desv.) Deccan: Mahableshwar, Sattara Fort walls, (Beddome).—Western ghats of the Peninsula of India, Ootacamund.—Europe; the Azores; Madeira; Canaries; Africa: Persia; Australia; New Zealand; South America.

91. *Vittaria elongata*, (Sw.) N. Kanara: below and above ghats, on trees (Macpherson).—South India, on the Western mountains, 2,000—5,000 feet; Ceylon; Central Provinces; North India from the plains up to about 4,000 feet; Malay Peninsula; Burma, etc.—Malay Islands; Queensland: Polynesia; Tropical Africa; Mauritius.

92. *Hemionitis arifolia*, (Burm.) Southern ghats and in Kanara (Gray).—South India, in the plains and in the mountains up to nearly 3,000 feet; East Bengal plains; Ceylon; Burma.—Philippines.

12. Acrosticheæ.

93. *Stenochlæna palustre*, (L.) N. Kanara: above and below ghats; climbs to the tops of the highest trees, (Macpherson). Goa and Sawantwadi, (Dalgado).—South India, in the plains of the West Coast and up the mountains to about 3,000 feet; Ceylon: North India, in the plains of Bengal and at low elevations on the hills; Malay Peninsula.—South China; Queensland; Fiji.

94. *Polybotrya appendiculata*, (Willd.) Belgaum, (Woodrow); on the ghat at Ghotne, east of Ratnagiri (Woodrow); Amboli: Matheran, (Birdwood).—Throughout the Indian region.—Philippines: Hong Kong.

95. *Polybotrya appendiculata*, (Willd.) var. *aspleniifolia* (Bory.) N. Kanara: above ghats.—South India, in moist evergreen forests on the western side up to nearly 4,000 feet.

96. *Gymnopteris variabilis*, (Hook.) North Kanara: above ghats, (Macpherson). Amboli (Woodrow).—Sikkim; Bhotan; Assam; Khasya: Cachar; South India, Tinnevelly mountains, Jeypore Hills.

97. *Gymnopteris variabilis*, (Hook.) var. *lanceolata*, (Hook.) Mahableshwar, on trees, (Birdwood); throughout the Western forests of the Presidency, (Beddome).—All over the Western forests of the Madras Presidency; Ceylon; Chota Nagpur; Parasnath; Burma.

98. *Gymnopteris variabilis*, (Hook.) var. *axillaris*, (Cav.) N. Kanara: above ghats, (Macpherson).—In all the Western forests of South India: Plains of Bengal and Assam; Burma.

99. *Gymnopteris contaminans*, (Wall.) N. Kanara: common in evergreen forests above and below ghats, (Macpherson). Castle Rock in shady woods (Woodrow); Matheran, (Birdwood).—South India, in the Western coast forests from the plains up to 4,000 feet; Ceylon; East Bengal, the lower hills up to 4,000 feet; Burma.

100. *Gymnopteris subcrenata*, (Hook. & Grev.) N. Kanara: common in evergreen forests above and below ghats, (Macpherson); Castle Rock, (Woodrow); Mahableshwar and Matheran, (Birdwood); Thana district, (Gray); not uncommon in the Western moist forests of the Presidency, (Beddome).—In the Western moist forests of the Madras Presidency up to about 4,000 feet; Ceylon; Central Provinces.

101. *Gymnopteris presliana*, (Hook.) N. Kanara: above and below ghats, common everywhere in river beds, (Macpherson); Konkan, (Law).—South India, Coorg.—Philippines.

102. *Acrostichum aureum*, (L.) N. Kanara: on the banks of salt-water creeks and in marshy places near the coast, (Macpherson).—Tidal backwaters throughout the Indian region.—Throughout the world in warm countries near the sea.

III.—OSMUNDACEÆ.

103. *Osmunda regalis*, (L.) N. Kanara: above ghats: in the bed of the river at Jogue and other places, also below ghats, (Macpherson). Mahableshwar, (Birdwood).—South India, on the Western mountains at the higher elevations; North India, Kumaon, Bhotan, Khasya, 4,000—6,000 feet.—Asia, North and South Africa, Central and North America, Europe.

IV.—SCHIZÆACEÆ.

104. *Lygodium microphyllum* (R. Br.) N. Kanara. above and below ghats, (Macpherson). Ghat jungles and South Konkan, (Gray).—South India, Malabar and West Coast generally, common in the plains, and also in the Wynad, up to about 3,000 feet; Cylon; North India, Bengal plains; Malay Peninsula.—Malay Islands.

105. *Lygodium flexuosum*, (Sw.) N. Kanara: below ghats, common during the rains, common also above ghats, (Macpherson); Castle Rock, (Woodrow); Konkan: southern part, (Gray); Penn to Campoli, (Woodrow); Matheran, (Birdwood); Deccan: Mahableshwar, (Birdwood); Ghat jungles, (Gray).—South India, common on both sides of the Madras Presidency up to about 4,000 feet. North India, plains and up to 5,000 feet; on the Himalayas; Ceylon; Malay Peninsula.—Malay Islands; Philippines; N. Australia: Tropical Africa.

V.—MARATTIACEÆ.

106. *Angiopteris evecta*, (Hoffm.) N. Kanara: above and below ghats, (Macpherson); Southern Konkan, (Gray).—Throughout the Indian region up to 7,000 feet.—Japan; Tropical Australia; New Caledonia; Madagascar: Polynesia.

VI.—OPHIOGLOSSACEÆ.

107. *Ophioglossum nudicaule* (L.) N. Kanara; below ghats: Karwar, in the rains, (Macpherson).—South India, Anamallay forests, and on the Western

mountains; Malay Peninsula.—America, from United States southward to Brazil; New Caledonia; Tropical Africa.

108. *Ophioglossum reticulatum.* (L.) In grassy places on the ghats, (Gray).—South India, Nilgiris and Anamallays, 2,000 feet and upwards; Ceylon, Newera Elya; Himalyas, Malay Peninsula.—Malay Islands; Polynesia; Tropical America; Africa; Mascareen Island; Philipines.

109. *Helmintostachys zeylanica,* (L.) Southern Konkan in swampy places (Gray).—South India, Western forests up to 3,000 feet; Ceylon; North India. Bengal plains to Assam and Cachar; Malay Peninsula.—Malay Islands; Philippines; Tropical Australia; New Caledonia.

110. *Botrychium virginianum*, (L.) var. *lanuginosum.* Ghats, (Gray).—South India, at the higher elevations on the Western mountains; Ceylon: North India, on the Himalayas, Kumaon to Bhotan, 5,000—8,000 feet; Khasya, 4,000—6,000 feet.—The typical plant in Europe, America, Japan.

It can hardly be expected that the above list is an exhaustive one. There are good reasons for assuming that in the southern parts of the Presidency many a species will be discovered that up to now, has only been seen in the western forests of the Madras Presidency. Also the Konkan and the Ghats along their whole length might prove less poor in species when examined more minutely. This will scarcely be the case with regard to Gujarat, Kathiawar, Cutch, and Sind, except perhaps the mountainous region of Kathiawar. On my tour in Cutch during the winter season I did not see a single species, not even a dried up relic of a fern. It is, however, possible that at least one fern, *Adiantum capillus veneris,* may be growing there, as this species occurs even in Sind.

If we consider that the number of known species on our globe amounts to 3,500, we must admit that the ferns are very poorly represented in the Bombay Presidency, forming only $\frac{1}{25}$ of the vascular vegetation; and more so, if we know that of all the ferns about 2,600 species belong to the Tropics. They usually form a great percentage of the vegetation of vascular plants, especially on islands and along the coast, *e.g.*, in Jamaica $\frac{1}{10}$, in Tahiti $\frac{1}{5}$, in St, Helena $\frac{1}{4}$. The countries situated at a greater distance from the sea are poorer in species, the ferns very often forming only $\frac{1}{32}$ — $\frac{1}{40}$ of the vascular flora. A considerable diminution of species is observed in those territories of the tropical and warm temperate region that are devoid of forest and, being exposed to a parching sun and dry winds, suffer from draught for some time of the year. Such conditions prevail in the greater part of the Bombay Presidency. Considering the amount of rainfall only in the various parts of the Presidency, it is natural to expect the greatest number of species in North Kanara, the Southern Ghats, and in places with climatic conditions similar to those observed in Mahableshwar. As a matter of fact three-fourths of all the species known in the Presidency have been found in North Kanara, and a good many of them find, as far as Bombay is concerned, their northern limit in that country. Of endemic specie not a single one has been discovered up to the present.

DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA.

BY

E. MEYRICK, B.A., F.R.S., F.Z.S.

VII.

(Continued from page 460 of this Volume.)

EPIBLEMIDÆ.

Eucosma trophiodes, n. sp.

♂ ♀. 16-23 mm. Head and thorax light greyish-ochreous, variably mixed with grey. Palpi moderately long, porrected, second joint strongly dilated with projecting scales above and beneath, terminal joint short. Abdomen in ♂ ochreous-whitish, base of segments blackish, with an expansible genital tuft of whitish-ochreous and black hairs, in ♀ greyish. Posterior tibiæ slightly rough-scaled. Forewings elongate, rather dilated posteriorly, costa gently arched, apex obtuse, termen sinuate, somewhat oblique; in ♂ whitish-ochreous, sometimes suffused with brownish-ochreous, costa spotted with dull green, with a longer very oblique mark from middle, with a basal fuscous patch whose edge runs from ⅓ of costa to ⅖ of dorsum, suffused with pale ochreous towards costa and mixed with green towards dorsum, and sometimes with a black mark in disc beyond middle; in ♀ ochreous-brown mostly suffused with grey and green towards costal and basal areas, and sprinkled with black, usually with a spot of whitish-ochreous suffusion towards termen in middle, apex sometimes suffused with whitish; three black dots near termen below middle, and sometimes other scattered small black dots above these: cilia ochreous, sometimes partially spotted with dark fuscous. Hindwings in ♂ with a dorsal fold filled with dense rough whitish-ochreous flocculent scales and hairs; grey, darker posteriorly: cilia whitish or pale grey, with darker subbasal line.

Maskeliya, Madulsima, Diyatalawa, Hakgala, Patipola, Newera Eliya, Ceylon (Pole, Green, Fletcher); Nilgiris (Andrewes); Coorg (Newcome); Khasis; from March to May, and August to November; twenty-five specimens.

TORTRICIDÆ.

Capua melissa, n. sp.

♂ ♀. 14-17 mm. Head, palpi, thorax, and abdomen light yellowish-ochreous, abdomen dorsally suffused with grey. Forewings elongate, rather dilated posteriorly, costa anteriorly moderately arched, apex obtuse, termen sinuate, somewhat oblique, costal fold in ♂ moderate, reaching from base to near middle; whitish-ochreous or pale yellowish-ochreous, with scattered deeper ochreous strigulæ, which are greyish near termen; basal patch hardly indicated, outer edge angulated below middle; central fascia yellow-brown, moderate on upper half, narrower and posteriorly suffused on lower half; costal patch yellow-brown, flattened-triangular, its apex connected by a more or less marked striga with termen below middle; cilia light ochreous-yellowish. Hindwings grey-whitish, faintly strigulated with grey, apex tinged with whitish-ochreous; cilia whitish-ochreous, with a faint grey subbasal shade.

Khasis, in March, June, and September: five specimens.

Capua melanatma, n. sp.

♂ ♀. 12-15 mm. Head and palpi light yellowish-ochreous. Thorax whitish-ochreous more or less irrorated with grey. Abdomen grey, segmental margins ochreous-whitish. Forewings rather elongate (shorter than in *melissa*), costa anteriorly moderately arched, apex obtuse, termen sinuate, rather oblique, costal fold in ♂ moderate, reaching from base to $\frac{2}{5}$; whitish-ochreous, with a few scatted ochreous strigulæ sprinkled with fuscous; basal patch little marked on costa and dorsum mixed with ochreous and dark fuscous, outer edge sometimes indicated by an ochreous stria, curved or bent below middle; central fascia moderately broad throughout, ochreous mixed with dark leaden-grey and blackish, posterior edge prominently dilated above tornus; costal patch fascia-like, reaching half across wing, dilated towards costa, ochreous mixed with dark leaden-grey and blackish: cilia whitish-ochreous. Hindwings light grey, somewhat strigulated with darker, posteriorly sometimes slightly tinged with whitish-ochreous; cilia whitish-ochreous, with a faint grey shade

Khasis, in June and September; fourteen specimens.

Cacœcia eupatris, n. sp.

♂. 20 mm. Head and thorax deep red-brown, thorax posteriorly pale brownish. Palpi short, ascending, deep ferruginous. Abdomen pale ochreous. Forewings suboblong, costa anteriorly moderately arched, posteriorly slightly sinuate, apex obtuse, termen somewhat sinuate beneath apex, vertical, rounded beneath, costal fold strong, extending from base to near $\frac{2}{5}$; red-brown, with a strong purplish-slaty gloss; a patch of pale ochreous somewhat raised scales beneath costal fold, partially edged beneath with deep red-brown; central fascia deep red-brown suffused with blackish above and below middle, very narrow on costa, much dilated downwards, becoming obsolete towards dorsum, posterior edge connected in middle with apex of triangular deep red-brown costal patch; a patch of pale ochreous suffusion towards tornus, above which is an elongate brown spot in middle; a dark brown mark at apex of wing: cilia deep red-brown with a slaty gloss at apex, becoming whitish-ochreous towards tornus. Hindwings grey, suffused with pale yellow in disc and towards costa, costa itself suffused with whitish; cilia grey, suffused with pale yellowish on dorsum and lower half of termen.

Wellawaya, Ceylon, in November (Green); one specimen. Allied to *C. epicyrta*, but forewings obviously broader anteriorly, and apex of hindwings grey, not yellow.

Cacœcia solida, n. sp.

♂. 19-20 mm. Head and thorax brown or reddish-brown. Palpi moderate, ascending, fuscous. Abdomen fuscous, anal tuft brownish-ochreous. Forewings suboblong, costa anteriorly moderately arched, posteriorly sinuate, apex obtuse, termen rather sinuate beneath apex, vertical, rounded beneath, costal fold strong, extending from base to beyond ⅔; fuscous, sometimes reddish-tinged; basal area suffused with dark purplish-fuscous; markings deep brown; a transverse blotch from dorsum forming posterior edge of basal patch, reaching half across wing; central fascia ill-defined, entire, very narrow on costa, much dilated downwards, posterior edge with an undefined projection in middle; costal patch extended as a wedge-shaped projection to termen above tornus: a dark purplish-fuscous mark along upper part of termen: cilia deep brown, towards tornus whitish-ochreous. Hindwings grey, costa very obscurely suffused with whitish-ochreous; cilia ochreous-whitish, partially suffused with grey.

Darjiling; two specimens.

Cacœcia cœmentosa, n. sp.

♂. 15 mm., ♀ 19-20 mm. Head and thorax whitish-ochreous or pale brownish-ochreous, patagia in ♂ dark fuscous. Palpi moderately long, porrected, whitish-ochreous, externally suffused with dark fuscous. Antennæ in ♂ moderately biciliated. Abdomen pale greyish, anal tuft whitish-ochreous. Forewings suboblong, costa in ♂ moderately and evenly arched, in ♀ straighter posteriorly, apex obtuse, termen straight, rather oblique, costal fold in ♂ moderate, extending from base to middle; whitish-ochreous; basal fourth of costa in ♂ suffused with dark fuscous, sometimes mixed with ferruginous; several ferruginous or fuscous strigulæ mixed with dark fuscous about edge of basal patch and towards apex and termen; a broad central fascia considerably dilated dorsally, and connected costal patch in ♂ formed of ferruginous-brown strigulæ mixed with dark leaden-grey, in ♀ dark ashy-fuscous edged with blackish-fuscous and partially ferruginous-tinged; in one ♂ these markings are merged in a general suffusion of dark fuscous irroration except towards costa anteriorly and base: cilia pale yellow-ochreous or whitish-ochreous, sometimes somewhat mixed with dark fuscous. Hindwings pale grey, sometimes marbled with darker; cilia pale whitish-ochreous, with faint grey line.

Khasis, in April and June; six specimens.

Cacœcia isozona, n. sp.

♂. 13 mm. Head, palpi, and thorax pale yellowish-ochreous, patagia mixed with dark fuscous, palpi moderately long, porrected. Antennæ moderately biciliated. Abdomen grey, anal tuft pale ochreous. Forewings suboblong, costa anteriorly moderately arched, posteriorly straight, apex obtuse, termen straight, somewhat oblique, costal fold strong, with projecting scales towards middle, extending from base to middle; whitish-ochreous, with scattered strigulæ of deeper ochreous, sprinkled with dark fuscous; basal fourth of costa suffused with dark fuscous; a small dark fuscous spot on dorsum at ¼; central fascia dark fuscous mixed with deep ochreous on margins and edged with some black scales anteriorly, moderately and evenly broad; costal patch dark fuscous mixed with brownish-ochreous: cilia whitish-ochreous. Hindwings grey; cilia whitish-ochreous with a grey shade.

Khasis, in June; one specimen. Superficially very like *Capua melanatma*.

Cacœcia operosa, n. sp.

♂ ♀. 11-14 mm. Head and thorax light brown. Palpi moderate, porrected light ochreous, externally mixed with dark fuscous. Antennæ in ♂ shortly ciliated. Abdomen fuscous, anal tuft of ♂ whitish-ochreous mixed with fuscous. Forewings suboblong, costa in ♂ bent before middle, nearly straight posteriorly, in ♀ tolerably evenly arched, apex obtuse, termen nearly straight, rather oblique, costal fold in ♂ strong, extending from base to near middle; light brown or brownish-ochreous, sometimes slightly reddish-tinged, obscurely strigulated with darker, sometimes sprinkled or strigulated with blackish; central fascia dark fuscous, more or less mixed with deep ferruginous and black, narrow on upper half, dilated near dorsum and followed on lower half by an undefined cloudy darker suffusion; costal patch flattened-triangular, dark fuscous, mixed with blackish; usually a spot or striga of deep ferruginous and blackish scales towards termen above tornus: cilia pale ochreous, beneath tornus fuscous. Hindwings and cilia grey.

Maskeliya, Madulsima, Diyatalawa, Ceylon (Pole, Vaughan, Fletcher, de Mowbray); Nilgiris (Andrewes); in August, October, and from January to May; twenty-five specimens.

Cacœcia translucida, n. sp.

♂. 13 mm. Head, palpi, and thorax pale brownish-ochreous much mixed with black, palpi moderate, porrected. Antennæ moderately biciliated with fascicles. Abdomen dark fuscous. Forewings suboblong, costa anteriorly moderately arched, posteriorly almost straight, apex obtuse, termen rather obliquely rounded, costal fold narrow, extending from base to beyond ⅓; pale brownish-ochreous, irregularly mixed with blackish, especially towards base; central fascia and entire area beyond it except a costal spot beyond middle ferruginous-brown mixed with fuscous and dark fuscous: cilia brown mixed with dark fuscous, towards tornus mixed with whitish-ochreous. Hindwings white, irrorated with dark fuscous towards base, costa, and dorsum; a dark fuscous terminal band, broader towards apex, its anterior edge irregular; cilia fuscous-whitish, with dark fuscous basal line.

Kashmir, 8,000 feet, in June (Nurse); one specimen.

Dicellitis, n. g.

Palpi curved, ascending, second joint dilated with rather rough scales, terminal joint rather short, obtuse. Thorax crested. Forewings with 3 and 4 stalked 8 and 9 out of 7, 7 to termen. Hindwings with 3 and 4 stalked, 5 rather approximated, 6 and 7 stalked.

Dicellitis nigritula, n. sp.

♀. 15-17 mm. Head dark fuscous. Palpi grey. Thorax pale brownish-ochreous, crest blackish-fuscous. Abdomen light grey. Forewings suboblong, costa anteriorly moderately, posteriorly gently arched, apex obtuse, termen subsinuate, somewhat oblique; pale yellowish-ochreous, suffusedly strigulated with light brownish; a dark fuscous spot on dorsum at ¼; central fascia brownish, ill-defined except on costal edge where it is dark fuscous and moderately broad, interrupted above middle, moderately broad beneath and dilated towards dorsum; costal patch and a triangular spot towards termen above tornus dark fuscous mixed with black and leaden-grey: cilia pale yellowish-ochreous. Hindwings grey; cilia pale greyish-ochreous with a grey shade.

N. Coorg, 3,500 feet, in August and October (Newcome); two specimens.

Epagoge invalidana, *Walk.* (*Tortrix invalidana*, Walk., XXVIII, 327.)

♂ ♀. 15-19 mm. Head and thorax brownish-ochreous. Palpi moderate, porrected, ochreous-whitish irrorated with fuscous. Abdomen ochreous-whitish, sometimes sprinkled with grey. Forewings suboblong, costa anteriorly strongly arched, posteriorly almost straight, apex obtuse, termen subsinuate, nearly vertical; in ♂ brownish or pale brownish-ochreous strigulated with fuscous, in ♀ whitish-ochreous, usually more or less tinged or suffused with pale brownish, sometimes sprinkled with brown dots, usually with a few black specks, in one specimen suffusedly irrorated with fuscous and dark slaty-fuscous; markings in ♂ rather dark fuscous, in ♀ ochreous-brownish or fuscous, variable and ill-defined, central fascia broad, narrowed on costal third, but in ♀ usually interrupted or broadly obsolete in disc, costal patch flattened-triangular, these sometimes represented in ♀ by a cloudy dark suffusion extending along dorsum and posterior ⅓ of costa; a more or less developed row of small black almost marginal dots before termen: cilia whitish-ochreous, tips suffused with fuscous or dark fuscous except on apex and tornus. Hindwings ochreous-whitish, more ochreous-tinged towards apex, towards dorsum and lower half of termen suffused with light grey; several fuscous strigulæ or small spots towards apex; cilia whitish-yellowish, on lower half of termen or in ♂ throughout with a grey shade.

Newera Eliya, Maskeliya, Madulsima, Kandy, Ceylon (Pole, Green, Alston, Vaughan); Coorg (Newcome); Khasis; practically throughout the year; twenty specimens. Its variability in tint and marking make it rather a puzzling species but the forms with suffused costal and dorsal streaks are characteristic.

Epagoge psammocyma, n. sp.

♂. 22 mm. Head, thorax and abdomen whitish-ochreous. Palpi rather long, obliquely porrected, whitish-ochreous, externally sprinkled with fuscous. Forewings suboblong, costa anteriorly strongly arched, posteriorly nearly straight, apex obtuse, termen sinuate, little oblique; whitish-ochreous, strigulated throughout with fuscous; central fascia towards costa narrow, fuscous, rest broad but only indicated by ill-defined limiting lines of fuscous suffusion, partially lost in the strigulation; costal patch fuscous: cilia pale whitish-ochreous with traces of brownish bars. Hindwings ochreous-whitish, posteriorly with faint greyish strigulæ; cilia whitish.

Palni Hills, 6,000 feet (Campbell); two specimens.

Epagoge harmonia, n. sp.

♂ ♀. 23-30 mm. Head and thorax deep ferruginous, posterior half of thorax lighter ochreous, face beneath a projecting tuft of scales ochreous-whitish. Palpi rather long, porrected, deep ferruginous. Abdomen whitish-ochreous. Forewings suboblong, in ♂ dilated posteriorly, costa anteriorly strongly posteriorly slightly arched, apex obtuse, termen sinuate, almost vertical ; pale ochreous, suffusedly strigulated with ferruginous-brown, more closely and suffusedly in ♀ : markings deep ferruginous sometimes strigulated with grey ; base of costa shortly suffused with deep ferruginous ; central fascia moderate and well-marked on costal third, becoming obsolete beneath ; costal patch well marked, posteriorly suffused and sometimes extended to apex : cilia pale ochreous, with a deep ferruginous shade becoming obsolete towards tornus. Hindwings and cilia pale whitish-yellowish, dorsum sometimes faintly greyish-tinged.

Sikkim, Darjiling, Khasis, from April to August ; eleven specimens.

Epagoge prochyta, n. sp.

♂ ♀. 11-12 mm. Head, palpi, and thorax reddish-ochreous, palpi moderate, ascending. Abdomen grey. Forewings suboblong, broadest before middle, costa anteriorly strongly arched, posteriorly nearly straight, apex obtuse, termen nearly straight, little oblique ; deep ochreous, suffusedly strigulated with brown-reddish, costa usually more or less strigulated with blackish ; markings deep ferruginous ; a more or less extensive suffused dorsal patch towards base ; central fascia reduced to a small well-marked spot on costa and a large undefined suffused patch on dorsum before tornus : costal patch well-defined, elongate-triangular, its apex resting on termen below middle : cilia pale ochreous. Hindwings dark grey ; cilia grey, sometimes whitish-suffused.

Khasis, in June and September ; six specimens.

Epagoge pantherina, n. sp.

♂. 12 mm. Head orange. Palpi rather slender, ascending, yellow-ochreous, becoming grey towards base. Antennæ fasciculate-ciliated. Thorax and abdomen dark indigo-fuscous. Forewings oblong, costa much arched near base, otherwise nearly straight, apex obtuse, termen slightly rounded, rather oblique ; 3 remote from angle ; bright orange, strewn with irregular leaden-metallic spots ; markings blackish-fuscous, also spotted irregularly with leaden-metallic ; a rather narrow basal fascia : central fascia broad on costa, much dilated on lower ⅔ so as to extend beyond tornus and almost coalesce with costal patch ; costal patch broad, fascia-like, almost reaching middle of termen: cilia orange, beneath tornus dark grey. Hindwings and cilia dark fuscous.

N. Coorg, 3,500 feet, in August (Newcome) ; one specimen.

Epagoge revoluta, n. sp.

♀. 21 mm. Head and thorax ochreous-brownish, face mixed with dark fuscous. Palpi moderate, porrected, brownish-ochreous suffusedly irrorated with dark fuscous. Forewings oblong, costa anteriorly very strongly arched posteriorly nearly straight, apex obtuse, termen subsinuate, nearly vertical ; 3 remote from angle ; light brown, strigulated with dark brown, especially on margins ; markings reddish-fuscous mixed with dark grey ; central fascia narrow, mostly obsolete in disc, rather broader towards dorsum ; costal patch flattened-triangular, edged anteriorly by a row of black strigulæ extended to termen below middle, and other black strigulæ towards apex and before termen, apical area tinged with reddish-fuscous : cilia light ochreous, with some grey dots. Hindwings pale ochreous with a few grey strigulæ towards termen, dorsal half pale grey ; cilia pale ochreous, with a grey line.

Khasis, in March ; one specimen.

Tortrix crocomis, n. sp.

♂. 16 mm. Head yellow. Palpi moderate, porrected, yellow, towards base fuscous, second joint largely expanded with scales towards apex. Antennæ simple. Thorax dark fuscous, anterior margin broadly yellow. Abdomen grey, anal tuft yellowish. Forewings elongate, costa strongly and evenly arched, apex round-pointed, termen faintly sinuate, oblique ; rather dark fuscous, an elongate-trapezoidal yellow patch extending along costa from base to ⅗, broadest posteriorly, costal edge dark fuscous at base ; a subtriangular yellow spot on dorsum at ¾, reaching half across wing : cilia fuscous. Hindwings and cilia grey.

Palni Hills, 6,000 feet (Campbell) ; one specimen.

Tortrix liquefacta, n. sp.

♂ ♀. 12 mm. Head and palpi ochreous-yellow, palpi moderate, porrected, second joint much expanded with scales, sprinkled with dark fuscous towards base. Thorax whitish-ochreous, anterior margin yellow-ochreous. Abdomen whitish-ochreous sprinkled with grey. Forewings elongate, posteriorly dilated, costa gently arched, apex round-pointed, termen sinuate, oblique ; whitish-ochreous, with about seven irregular transverse partially interrupted ochreous-yellow striæ ; margins marked with scattered black strigulæ ; basal fifth of costa suffused with dark grey ; a subtriangular blackish-grey spot on dorsum near base ; central fascia leaden-grey marked with black, extending from costa to lower angle of cell, hardly indicated below this : costal patch small, leaden-grey marked with black : cilia ochreous-yellowish. Hindwings in ♂ pale whitish-ochreous, dorsal edge greyish, in ♀ very pale greyish, obscurely strigulated with darker : cilia whitish-ochreous.

Khasis, in July and November ; two specimens.

Tortrix insulata, n. sp.

♂ 14-16 mm., ♀ 16-18 mm. Head, palpi, and thorax yellow-ochreous, palpi moderate, porrected, second joint much expanded with scales. Abdomen pale greyish, anal tuft whitish-ochreous. Forewings suboblong, more elongate in ♀, costa anteriorly moderately arched, posteriorly rearly straight, especially in ♀, apex obtuse, termen faintly sinuate, oblique ; yellow-ochreous ; in ♂ a blackish dot towards dorsum at ⅓, indicating edge of basal patch ; central fascia represented in ♂ by costal, submedian, and dorsal blackish-grey spots, in ♀ by small dorsal spot only ; costal patch in ♂ small, blackish-grey, in ♀ absent: cilia pale ochreous-yellowish. Hindwings ochreous-whitish, dorsal half slightly greyish-tinged ; cilia ochreous-whitish.

Simla, in July ; six specimens.

Schœnotenes, n. g.

Antennæ in ♂ biciliated with long fascicles. Palpi rather long, porrected, second joint with rough scales above towards apex, terminal joint moderate. Forewings in ♂ without costal fold; 1. c bent up and connected with 2 near origin, 3-5 approximated from angle, 7 to termen, cell rather narrow and short, lower parting-vein strongly marked. Hindwings with 3 and 4 connate, 5 approximated, 6 and 7 short-stalked.

Type *S. synchorda.*

Schœnotenes synchorda, n. sp.

♂. 16 mm. Head and thorax white. Palpi grey, internally white. Abdomen ochreous-grey-whitish. Forewings suboblong, costa anteriorly moderately, posteriorly slightly arched, apex obtuse, termen nearly straight, somewhat oblique; white, margins marked with fuscous strigulæ; a fuscous basal patch marked with dark fuscous, darkest towards costa, outer edge nearly vertical; central fascia represented by a small fuscous spot marked with dark fuscous on costa, whence proceed two or three curved series of small fuscous strigulæ to dorsum, between which is some slight fuscous suffusion on upper half; costal patch flattened-triangular, fuscous mixed with dark fuscous; two series of small fuscous strigulæ before termen: cilia white, with a series of pale fuscous spots before middle. Hindwings and cilia whitish.

Khasis, in July; one specimen.

Schœnotenes semifulva, n. sp.

♀. 12-13 mm. Head and thorax ferruginous-ochreous. Palpi ochreous mixed with dark fuscous, towards base white beneath. Abdomen fuscous. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen sinuate, rather oblique; rather dark fuscous, marbled with dark leaden-grey, veins lined with dark fuscous; basal area occupied by a large pale ochreous patch suffusedly mixed with ferruginous, outer edge running from before ⅖ of costa to ⅖ of dorsum, slightly curved; several whitish dots on costa posteriorly; in one specimen small suffused ochreous spots beneath costa at ⅔ and above tornus: cilia rather dark fuscous. Hindwings and cilia fuscous.

Khasis, in October; three specimens.

Homalernis, n. g.

Antennæ in ♂ shortly ciliated. Palpi moderate, porrected, second joint much expanded with scales towards apex, terminal joint rather short. Forewings with slightly raised scales, in ♂ without costal fold; 1.c approximated to 2, 3 and 4 approximated, 7 to termen. Hindwings with 3 and 4 connate, 5-7 tolerably parallel.

Homalernis semaphora, n. sp.

♂ ♀. 12 mm. Head and thorax white. Palpi white, second joint grey externally except towards apex. Abdomen grey-whitish. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, termen nearly straight, very oblique; white, with dots of slightly raised scales faintly tinged with grey or yellowish; some black dots along costa and termen; a triangular blackish spot on middle of costa, reaching about ⅓ across wing; a small black spot on costa at ¾, whence proceeds a curved ochreous line dotted with grey to termen above tornus, and two enlarged black dots on costa towards apex ; a black dot in disc at ⅔ : cilia white. Hindwings pale grey ; cilia whitish.

Khasis, in June ; two specimens.

Pternozyga, n. g.

Antennæ in ♂ serrulate, shortly ciliated. Palpi very long, porrected, second joint expanded with scales above and beneath, terminal rather short. Thorax crested. Forewings with large dorsal tuft of projecting scales beyond middle, in ♂ without costal fold ; 1c bent and approximated to 2 near origin, 3-5 closely approximated at base, 7 and 8 stalked, 7 to termen, 9 closely approximated to 8 towards base, lower parting-vein strongly marked. Hindwings with 3 and 4 connate, 5 rather approximated, 6 and 7 closely approximated towards base.

Pternozyga haeretica, n. sp.

♂. 16-17 mm. Head and thorax pale greyish-ochreous, thoracic crest mixed with dark fuscous. Palpi pale ochreous irrorated with fuscous. Abdomen pale greyish-ochreous tinged with fuscous. Forewings elongate posteriorly dilated, costa moderately and evenly arched, apex obtuse, termen sinuate, vertical ; light yellowish-ochreous, sometimes with scattered blackish scales tending to form irregular strigulæ ; basal third much glossed or suffused with silvery-whitish ; basal patch sometimes separated from central fascia by a group of whitish striæ ; a dark fuscous patch occupying whole area beneath a line drawn from dorsum near base to apex or just beneath apex of wing, crossed by two irregular bluish-leaden-metallic whitish edged marks from middle of dorsum ; a silvery-whitish striga from ⅔ of costa to termen above middle, broader and sometimes furcate towards costa, and a short similar mark near termen below middle ; a series of small bluish-leaden-metallic, sometimes partly confluent spots just before termen, apical one surrounded with ferruginous or reddish suffusion : cilia grey with two dark grey shades, becoming pale ochreous round apex. Hindwings grey, darker strigulated, towards base whitish-tinged ; cilia grey-whitish, with a grey shade.

Palni Hills, 6,000 feet (Campbell) ; Nilgiris, 6,000 feet (Andrewes) ; in May two specimens.

Protopterna, n. g.

Antennæ in ♂ dentate, fasciculate-ciliated. Palpi moderately long, porrected, second joint expanded with scales towards apex, terminal short, thick. Thorax with strong crest. Forewings with dorsal tuft of projecting scales beyond middle, in ♂ without costal fold ; 1c bent up towards origin of 2, 3 and 4 closely approximated, 7 and 8 separate, 7 to termen, lower parting-vein strongly developed. Hindwings with 3 and 4 connate, 5 rather approximated, 6 and 7 somewhat approximated towards base.

Protopterna chalybias, n. sp.

♂ ♀. 10-12 mm. Head and thorax dark bronzy, thoracic crest blackish, sometimes margined on each side with an ochreous-white spot. Palpi rather dark ochreous-fuscous, beneath white. Abdomen dark fuscous, beneath whitish-ochreous. Forewings subtriangular, costa moderately arched, apex obtuse, termen somewhat rounded, rather oblique; blackish-fuscous, basal area sometimes ochreous or brownish more or less mixed with blackish; four transverse series of blue-leaden-metallic finely black-edged spots or marks, first near base with an enlarged spot on basal portion of costa, two near together before middle rising from whitish costal strigulæ, and one before termen: a patch of ferruginous-ochreous suffusion on posterior ⅔ of costa, marked with four small ochreous-white costal spots, of which the first originates an oblique blue-leaden-metallic black-edged elongate mark: cilia ochreous-white, with a black basal line, and blackish-grey patches at apex, middle of termen, and tornus. Hindwings grey, thinly scaled, apex and termen suffused with dark fuscous; cilia pale grey, with dark fuscous subbasal line.

Coorg (Newcome); Khasis; from September to November, seven specimens.

Tymbarcha, n. g.

Antennæ in ♂ minutely ciliated. Palpi moderate, porrected, second joint expanded with scales above towards apex, terminal joint short. Forewings with costa angularly bent and prominent in middle, surface with slight tufts of scales, in ♂ without costal fold; 3 and 4 stalked, 5 approximated, 7 and 8 stalked, 7 to termen. Hindwings with 3 and 4 stalked, 5 approximated, 6 and 7 closely approximated towards base.

Tymbarcha cerinopa, n. sp.

♂. 13 mm. Head, palpi, thorax and abdomen pale whitish-ochreous. Forewings elongate, costa abruptly bent in middle, so that the wing is much widest at this point and narrows rapidly to either end, ciliated on and beyond prominence to apex, apex obtuse, termen sinuate, short, nearly vertical; whitish-ochreous, veins more ochreous, strewn with small tufts of scales finely sprinkled with blackish, tending to be arranged in transverse series; basal patch, a narrow central fascia starting from a small whitish spot on costa, and a streak along posterior part of costa and termen suffusedly glistening silvery-whitish: cilia ochreous-whitish, with a deep ochreous shade, at tornus suffused with deeper ochreous and more fuscous towards tips. Hindwings pale whitish-grey-ochreous, cilia ochreous-whitish.

Khasis; one specimen.

Argyrotoxa, Stph.

Antennæ in ♂ minutely ciliated. Palpi moderately long, porrected, second joint triangularly expanded with scales, terminal joint short. Forewings with tufts of raised scales on surface, in ♂ without costal fold; 3-5 approximated, 7 to termen. Hindwings with 3 and 4 connate or stalked, 5 approximated, 6 and 7 closely approximated towards base.

Type *A. bergmanniana*, L. I find it desirable to reconstitute this genus (which had been abandoned by myself and others), to include those species which differ from *Tortrix* by the possession of scale-tufts on the surface of forewings, and from *Oxygrapha* by the terminal ending of vein 7; in other characters the species appear to be quite intermediate. To this genus the European *forskaleana*, L. and *bifasciana*, Hb. belong.

Argyrotoxa glaucomis, n. sp.

♂ ♀. 16-18 mm. Head light ochreous. Palpi pale ochreous irrorated with dark fuscous. Thorax greyish or brownish-ochreous, sometimes whitish-mixed. Abdomen grey, apex whitish-ochreous. Forewings suboblong, costa strongly arched throughout and somewhat roughened with scales posteriorly, apex round-pointed, termen sinuate, rather oblique; dark fuscous suffused with dull olive-greenish, irregularly and suffusedly striated transversely with leaden-metallic; a large very variable oval blotch occupying basal ⅔ of costa and reaching more than half across wing, dark brown, or dark indigo-fuscous, or white more or less marked with dark fuscous, sometimes nearly obsolete, often margined posteriorly by a small conspicuous white costal spot; in one specimen this white spot is extended as an irregular transverse streak to dorsum; sometimes instead of the blotch there is a round black spot in disc about ¼; a large tuft of scales in middle of disc, and another on submedian fold beyond middle: cilia fuscous, base ochreous-tinged. Hindwings and cilia grey.

Khasis, in June and July: twenty-five specimens.

Argyrotoxa elæarcha, n. sp.

♂ ♀. 16-17 mm. Head and thorax ochreous-whitish, patagia whitish-ochreous. Palpi ochreous irrorated with fuscous, internally whitish. Abdomen grey. Forewings elongate-oblong, costa strongly arched near base, thereafter nearly straight, apex round-pointed, termen sinuate, somewhat oblique; dull olive-greenish, irregularly marked and striated with glistening leaden-grey-whitish; a patch of leaden-grey scales mixed with blackish on base of costa, followed by a glistening grey-whitish patch; dorsum from ¼ to ⅔ suffused with reddish-ochreous; several tufts of scales on dorsal half-anteriorly, a large tuft tipped with black in disc at ⅗, preceded by a dark reddish-fuscous mark, and a transverse ridge tipped with black towards apex; tornal area mixed with crimson-fuscous, with a well-marked oblique silvery-whitish streak from tornus. cilia ochreous with a suffused fuscous-crimson shade and apical patch, on tornus grey. Hindwings and cilia grey.

Khasis; two specimens.

Argyrotoxa chionocentra, n. sp.

♂. 15 mm. Head, palpi, and thorax fuscous, lower part of face and palpi internally whitish. Abdomen grey, apex whitish-ochreous. Forewings oblong, costa much arched near base, thence almost straight, apex round-pointed, termen sinuate, hardly oblique; reddish-fuscous, with several irregular transverse purplish-leaden glossy streaks, and between these several transverse series of very small grey tufts tipped with black; a small snow-white spot in disc at ⅔, nearly preceded by a larger tuft, and an elongate white dot obliquely beneath and before this: cilia reddish-fuscous, apical half whitish-ochreous on termen except towards tornus. Hindwings ochreous-whitish, dorsal half suffused with light grey, apex and termen narrowly suffused with darker grey, cilia pale whitish-ochreous, with a grey shade.

Khasis, in July ; one specimen.

Eboda obstinata, n. sp.

♀. 13-14 mm. Head and thorax ochreous-fuscous sprinkled with blackish. Palpi brownish-ochreous sprinkled with dark fuscous. Abdomen grey. Forewings elongate-oblong, costa abruptly arched near base, thence nearly straight, apex rounded-obtuse, termen slightly rounded, somewhat oblique : brownish-ochreous ; markings deep ferruginous suffusedly mixed with dark fuscous and a few black scales ; basal patch with outer edge oblique, sometimes nearly obsolete dorsally, sometimes extended as a broad dark fuscous dorsal suffusion to coalesce with central fascia ; central fascia moderately broad, broadly confluent in middle with large suffused costal patch ; a black and ferruginous striga extends from costal patch to tornus, and another round apex and upper part of termen : cilia whitish-ochreous. Hindwings fuscous ; cilia whitish-ochreous with a fuscous shade.

Puttalam, Ceylon, in November (Pole) ; two specimens. Vein 7 of forewings terminates about the apex, but both in this species and *smaragdinana* the apex is so obtusely rounded off as not to be exactly definable, therefore the termination of 7 should be treated as indefinite.

Oxygrapha rapax, n. sp.

♂ ♀. 17-19 mm. Head, palpi, and thorax fuscous. Abdomen grey. Forewings elongate, narrow, costa gently arched, apex pointed, termen sinuate, oblique, fuscous mixed with whitish-fuscous, and transversely striated with ferruginous mixed with dark fuscous and blackish ; a basal patch especially mixed with blackish, extending to ⅓ of wing, marked with a pale yellowish dot towards costa near base, and a large ridge of scales on its outer edge : cilia fuscous. Hindwings very elongate-trapezoidal, fuscous ; cilia fuscous.

Maskeliya and Maturatta, Ceylon, in June, September and October (Pole, de Mowbray) ; three specimens. The narrowest-winged species of the genus known to me.

Oxygrapha halidora, n. sp.

♂ ♀. 12-15 mm. Head grey. Palpi dark grey irrorated with white. Thorax whitish-greenish mixed with dark grey. Abdomen pale ochreous irrorated with dark grey. Forewings elongate, narrower in ♀, costa gently arched, bent at ¼, apex round-pointed, termen sinuate, oblique ; light brownish, coarsely and irregularly strigulated with black ; based ⅖ more or less wholly suffused with light greenish, mixed with olive-green, edge of basal patch indicated by a black striga ; median area towards costa and dorsum more or less suffused with slaty-purplish ; posterior area transversely streaked with dark ferruginous-brown : cilia light brownish suffusedly irrorated with blackish. Hindwings fuscous or rather dark fuscous, sometimes ochreous-tinged ; cilia light fuscous or ochreous-fuscous.

Patipola and Maskeliya, Ceylon (Green, Pole, Alston) ; Khasis ; in February, and from May to September, nine specimens.

Oxygrapha curiosa, n. sp.

♀. 17 mm. Head pale grey sprinkled with darker and whitish. Palpi dark grey irrorated with whitish. Thorax pale grey mixed with black, shoulders brown. Abdomen dark grey. Forewings moderate, rather dilated posteriorly, costa strongly arched, apex pointed, termen sinuate, oblique; rather dark violet-grey, partially brownish-tinged and sprinkled with whitish, with some irregularly arranged black raised scales; several irregular black strigæ from costa about ⅓, and in disc in middle and at ¾; large tufts of scales towards dorsum before and beyond middle; an irregular prismatic purple-blue blotch beneath disc at ⅔; an 8-shaped tornal spot outlined with black, upper half filled with brownish and lower with white; an evenly broad ferruginous-brown streak from beyond ⅔ of costa to below middle of termen, edged with some black scales; a ferruginous-brown streak along apical part of costa, posteriorly triangularly dilated and edged on termen with blackish: cilia pale brownish with dark brown antemedian shade, and posterior dark fuscous patches at apex, middle, and tornus. Hindwings dark grey, lighter towards base: cilia whitish-grey, with fuscous subbasal shade.

Khasis, in October; one specimen.

Oxygrapha porpacias, n. sp.

♂♀. 16-20 mm. Head and thorax grey. Palpi whitish, irrorated with grey and black except towards base. Abdomen grey. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, termen sinuate, rather oblique; ochreous-whitish, finely and suffusedly irrorated with grey, and strigulated with brown and dark grey, with a few black scales: three black dots longitudinally placed just above tornus, first usually minute, second elongate, third terminal: cilia whitish with rows of fuscous points, basal half with indistinct fuscous bars tipped with dark fuscous, a tornal patch mixed with dark grey and blackish. Hindwings rather dark fuscous, darker posteriorly; cilia rather dark fuscous.

Puttalam, Muskeliya, Peradeniya, and Gampola, Ceylon (Pole, Green, Alston): Muoklek, Siam; in June and from October to February, nine specimens.

XYLORYCTIDÆ.

Metathrinca, n. g.

Head with appressed scales, sidetufts spreading; ocelli present; tongue developed. Antennæ ¾, in ♂ bipectinated, apex simple. Labial palpi long, recurved, second joint with appressed scales, terminal joint rather shorter, acute. Maxillary palpi rudimentary. Posterior tibiæ clothed with long hairs. Forewings with 2 from ⅚ or angle, seldom stalked with 3, 4 absent, 5 approximated, 7 and 8 stalked, 7 to costa, 9 absent, 10 and 11 remote. Hindwings somewhat over 1, ovate, cilia ½; 3 and 4 stalked, 5 somewhat approximated, 6 and 7 remote, diverging.

Type *M. ancistrias*, Meyr. Formerly treated as a section of *Ptochoryctis*, but the discovery of a second species makes it desirable to give it generic rank.

Metathrinca ophiura, n. sp.

♂. 13-15 mm. Head fuscous, face prismatic-white except on margins. Palpi whitish, second joint infuscated towards base, terminal joint anteriorly suffused with dark fuscous. Antennæ blackish, pectinations 6. Thorax white, posterior extremity with a blackish spot. Abdomen white, segments banded with ferruginous-reddish. Forewings elongate, moderate, costa strongly arched, apex obtuse, termen slightly rounded, oblique; 2 and 3 closely approximated towards base or stalked; shining white; an irregular moderate pale greyish-silvery partially brownish-suffused fascia extending round apical fourth of costa and upper half of termen, thence suddenly curved inwards and terminating on dorsum before tornus, edged with blackish on costal portion and round apical margin, and suffusedly blackish-edged towards dorsum, anterior edge in middle emitting a cloudy fuscous streak-like projection: cilia white, at apex with a black median vertical mark, beneath this with two fuscous transverse bars. Hindwings whitish; cilia white.

Muskeliya, Puttalam, Eppawela, Wellawaya, and Galle, Ceylon, in April, May, September and December (Alston, Pole, Green, Fletcher); six specimens. Exceedingly like *ancistrias*, but much smaller (my smallest *ancistrias* is 19 mm., the small Puttalam insect referred to in my description being really *ophiura*), and best distinguished by the neuration: in *ancistrias* vein 2 of forewings rises from $\frac{2}{3}$ of cell, fairly remote from 3, whilst in *ophiura* 2 and 3 are closely approximated, rising from angle of cell, or even stalked.

Linoclostis, n. g.

Head with appressed scales, sidetufts spreading; ocelli present; tongue, short. Antennæ $\frac{3}{4}$, in ♂ bipectinated, apex simple. Labial palpi long, recurved, second joint with appressed scales, terminal joint much shorter, acute. Maxillary palpi rudimentary. Posterior tibiæ clothed with long hairs. Forewings with vein 2 from $\frac{4}{5}$ of cell, 3 and 4 stalked from angle, 5 closely approximated at base, 6 absent, 7 and 8 stalked, 7 to termen, 9 absent, 10 and 11 remote. Hindwings somewhat over 1, ovate-trapezoidal, cilia $\frac{2}{3}$: 3 and 4 short-stalked, 5 parallel, 6 and 7 remote, diverging.

Linoclostis gonatias, n. sp.

♀. 23 mm. Head and thorax white, lower part of face infuscated. Palpi fuscous. Antennæ dark grey. Abdomen ochreous-grey-whitish. Forewings elongate, somewhat dilated posteriorly, costa moderately arched, apex obtuse, termen slightly rounded, oblique; shining white; costal edge dark fuscous towards base; a slender fuscous subterminal line from $\frac{3}{4}$ of costa to tornus, almost right-angled in middle; a slender ochreous-brownish line along apical sixth of costa, cilia beginning abruptly at its origin: cilia white, with a fine dark fuscous line at $\frac{1}{4}$, on outer half with a light brownish patch at apex and two spots below this. Hindwings grey-whitish; cilia white.

Khasis, in June; one specimen. A ♂ from Java, almost certainly of the same species, has palpi white, antennæ black, lateral margins of face pale brownish, expanse 17 mm.

Amorbæa, n. g.

Head with appressed scales, sidetufts somewhat spreading; ocelli absent; tongue developed. Antennæ ⅘, in ♂ filiform, minutely ciliated. Labial palpi very long, recurved, slender, second joint with appressed scales, terminal joint nearly as long, acute. Maxillary palpi rudimentary. Posterior tibiæ clothed with long hairs. Forewings with vein 2 from ⅘ of cell, 3 and 4 stalked, 5 approximated 7 and 8 stalked, 7 to apex or just beneath, 9 absent, 10 and 11 remote. Hindwings over 1, ovate-trapezoidal, cilia ⅓; 3 and 4 connate, 5 parallel, 6 and 7 remote, diverging.

Type *A. hepatica*.

Amorbæa hepatica, n. sp.

♂ ♀. 22-26 mm. Head light ochreous-orange. Palpi ochreous-yellowish, toward base somewhat infuscated. Antennæ whitish-ochreous. Thorax brownish-ochreous suffused with prismatic purple-grey, especially in ♂. Abdomen ochreous-yellowish. Forewings elongate, costa gently arched, apex obtuse, termen obliquely rounded; purple-brownish-ochreous, more purplish towards base; costal edge finely yellowish: cilia brownish-ochreous. Hindwings and cilia ochreous-yellowish, with a slight fuscous tinge.

Bombay (Young); two specimens.

Amorbæa alma, n. sp.

♀. 24 mm. Head light ochreous-orange, face paler. Palpi ochreous-yellowish, base infuscated. Antennæ pale yellowish spotted with brownish. Thorax light yellow-ochreous. Abdomen ochreous-yellow. Forewings elongate, costa gently arched, apex obtuse, termen obliquely rounded; light yellow-ochreous: cilia light yellow-ochreous. Hindwings and cilia light ochreous-yellowish.

Coorg, 3500 feet, in June (Newcome): one specimen.

Hermogenes, Zell.

I am now disposed to treat *Epichostis*, Meyr. as a synonym of this genus, which was founded by Zeller on one Indian species, *aliferella*. To this genus is also referable the species described by me as *Chaliniastis metrodelta*. I now add eight additional species. The most important variations of structure are that vein 7 of forewings may terminate in costa, apex, or termen, but usually close to the apex, which tends to be indefinite in position, and that veins 7 and 9 are sometimes stalked, as in Zeller's figure, but are much more usually separate; in all the species, including *aliferella*, they appear to be normally separate, though not invariably, with the exception of *melanocona*, in which they are usually but not constantly stalked. The rough hairscales on the anterior tibiæ and tarsi and the posterior tarsi of *aliferella*, are not found in the other species, but do not seem to justify generic separation.

Hermogenes leucorma, n. sp.

♂ ♀. 20-22 mm. Head and thorax rather dark brown. Palpi whitish-ochreous, second joint with lower ⅔ and a subapical ring brown, terminal joint with base and anterior edge dark fuscous. Antennæ pale ochreous more or less mixed with fuscous. Abdomen fuscous, anal tuft yellowish. Forewings elongate, rather narrow, posteriorly dilated, costa slightly arched, apex obtuse, termen nearly straight, somewhat oblique; 7 to apex; rather dark ochreous-brown; stigmata dark fuscous, first sometimes connected with dorsum by an undefined oblique triangular patch of dark fuscous suffusion; a few whitish scales towards costa and dorsum about middle; a subterminal series of seven cloudy white marks, central and dorsal rather elongated inwards, and a terminal series of six similar marks: cilia pale ochreous, with two rather indistinct fuscous shades. Hindwings grey or dark grey; cilia pale greyish-ochreous becoming grey towards dorsum, with a dark grey subbasal shade.

Khasis, in July; four specimens.

Hermogenes stelota, n. sp.

♂. 17 mm. Head ferruginous-brown. Palpi ferruginous-yellow, towards base slightly infuscated. Antennæ dark fuscous. Thorax dark fuscous, shoulders suffused with ferruginous-brown. Abdomen dark fuscous, anal tuft yellowish. Forewings elongate, narrow towards base, posteriorly dilated, costa slightly arched, apex obtuse, termen almost straight, somewhat oblique; 7 to just below apex; rather dark fuscous, with faint purplish tinge; costal edge and costal extremities of veins ferruginous-ochreous except towards base; a short subcostal ferruginous streak from base; two narrow blackish fasciæ edged with ferruginous, first about $\frac{2}{5}$, slightly oblique, almost reaching dorsum but not nearly costa, second about $\frac{4}{5}$, direct, reaching dorsum but not costa; some black scales indicating a curved subterminal line; a blackish terminal line: cilia ochreous, towards tips paler and fuscous-tinged. Hindwings fuscous; cilia pale ochreous with three fuscous shades.

Khasis; one specimen.

Hermogenes tympanias, n. sp.

♂ ♀. 18-23 mm. Head whitish-ochreous, more or less yellowish-tinged, in ♀ suffused with fuscous except on sides. Palpi whitish-ochreous, more or less yellowish-tinged, lower $\frac{2}{3}$ of second joint fuscous, extreme base of terminal joint fuscous in ♀. Antennæ pale ochreous-yellowish, indistinctly spotted with fuscous. Thorax in ♂ light brownish-ochreous, in ♀ fuscous, margins more or less yellow. Abdomen whitish-ochreous suffused with fuscous. Forewings elongate, narrow, posteriorly dilated, costa slightly arched, faintly sinuate in middle, apex obtuse, termen straight, slightly oblique; rather light fuscous, somewhat deeper in ♀; costal edge except towards base, and veins towards costa more or less streaked with ferruginous-yellow, and costal area in ♂ variably suffused with light ochreous-yellowish; two large sharply marked black dorsal blotches, edged with pale yellowish, first rounded-triangular, extending on dorsum from base to near $\frac{2}{5}$ and reaching more than half across wing, second irregular-trapezoidal, reaching $\frac{3}{4}$ across wing and extending in disc from before middle to $\frac{4}{5}$, but more or less considerably narrowed towards dorsum, posterior edge obtusely prominent in middle of wing; an interrupted black terminal line: cilia brownish-ochreous, with a fuscous shade. Hindwings in ♂ grey, in ♀ dark grey; cilia in ♂ yellowish with a light fuscous shade, in ♀ grey.

Khasis, from June to September: fifteen specimens. Allied to *elephantias*, but larger, and readily distinguishable by the contraction of the second blotch towards dorsum.

Hermogenes melanocona, n. sp.

♂. 13-17 mm. Head ochreous-yellowish, sometimes centrally fuscous-tinged. Palpi ochreous-whitish, second joint with basal ¾ yellowish-fuscous and a subapical ring dark fuscous. Antennæ ochreous-yellowish ringed with fuscous. Thorax light violet-fuscous. Abdomen grey, apex whitish-ochreous. Forewings elongate, rather narrow, somewhat dilated posteriorly, costa slightly arched, apex obtuse, termen slightly sinuate, somewhat oblique; 7 and 9 usually stalked (in seven specimens out of eight), 7 to costa; light violet-fuscous, costa suffused with pale ochreous except towards apex; a variable transverse or subtriangular blackish blotch on dorsum before middle, edged with whitish-yellow, reaching nearly ¾ across wing; second discal stigma black, moderate, edged with whitish-ochreous; a transverse streak of blackish suffusion from ⅗ of costa to before tornus, becoming obsolete dorsally, curved inwards on upper half; an interrupted blackish terminal line: cilia pale ochreous, sometimes with a fuscous shade. Hindwings pale grey; cilia whitish-ochreous, on dorsum greyish-tinged.

Maskeliya, Ceylon, from August to January (Pole, de Mowbray); eight specimens.

Hermogenes barathrias, n. sp.

♂♀. 13-17 mm. Head and thorax dark purplish-fuscous, with a ferruginous streak above eyes, face pale ochreous. Palpi pale yellowish, second joint with basal ⅔ and a subapical ring dark fuscous, base of terminal joint dark fuscous. Antennæ and abdomen dark fuscous. Forewings elongate, rather narrow, posteriorly dilated, costa gently arched towards extremities, apex obtuse, termen almost straight, somewhat oblique; 7 to costa; dark purplish-fuscous; extreme costal edge pale yellowish in ♂ except towards extremities: markings blackish, with slight ferruginous tinge, obscurely edged with ochreous-whitish; a variable transverse or subtriangular blotch from dorsum before middle, reaching ¾ across wing; second discal stigma rather large; a rather narrow straight subterminal fascia, anterior edge curved inwards on upper half, posterior edge not pale-margined; a blackish terminal line: cilia purplish-fuscous, basal third darker, tips ochreous-whitish. Hindwings and cilia dark grey.

Patipola, Newera Eliya and Maskeliya, Ceylon, in November and from March to May (Alston, Pole); eight specimens.

Hermogenes dicremna, n. sp.

♂♀. 16-19 mm. Head and thorax brown, face whitish-ochreous. Palpi whitish-ochreous, second joint with lower ¾ and an indistinct subapical ring brownish, terminal joint with base and anterior edge dark fuscous. Antennæ dark fuscous. Abdomen in ♂ whitish-ochreous, in ♀ fuscous. Forewings elongate, posteriorly dilated, costa gently arched apex obtuse, termen almost straight, rather oblique; 7 to costa; violet-brownish, variable in depth, sometimes mixed with pale ochreous-yellowish towards costa; costal edge ochreous-yellowish; sometimes a brown basal patch more or less indicated, obsolete towards costa; a dark ferruginous-brown variable transverse blotch on middle of dorsum, sometimes narrowed upwards, reaching about ¾ across wing, anterior edge nearly vertical and edged first with dark fuscous and then with whitish; second discal stigma dark fuscous, partially whitish-edged; a narrow transverse dark ferruginous-brown subterminal fascia, sinuate inwards and strongest on upper half, attenuated dorsally, more or less yellowish-edged anteriorly; an interrupted blackish terminal line: cilia pale ochreous with one or two fuscous or dark fuscous shades, base sometimes yellowish. Hindwings in ♂ whitish-grey, in ♀ grey; cilia whitish-ochreous, sometimes yellowish-tinged, round apex with one or two faint fuscous lines.

Maskeliya, Ceylon, in July and from October to March (Pole): sixteen specimens.

Hermogenes antiguma, n. sp.

♂♀. 18-22 mm. Head yellow-ochreous, in ♀ brownish-tinged. Palpi whitish-ochreous, second joint with basal ⅔ and a subapical ring more or less fuscous. Antennæ pale yellowish ringed with fuscous. Thorax fuscous. Abdomen in ♂ whitish-ochreous, in ♀ rather dark fuscous mixed with yellowish on sides. Forewings elongate, posteriorly dilated, costa gently arched towards extremities, apex obtuse, termen slightly sinuate, rather oblique; 7 to costa (in one wing of ♀ stalked with 9): in ♂ ochreous-yellowish, more or less irrorated with fuscous except towards costa, in ♀ rather dark violet-fuscous, towards costa suffused with whitish-ochreous, costal edge ochreous-yellow; an irregular inwardly oblique wedge-shaped dark fuscous blotch from dorsum beyond middle, reaching ⅔ across wings, in one ♂ reduced to a small dorsal spot, apex persistent as blackish first discal stigma: second discal stigma also black; an irregular narrow subterminal fascia of dark fuscous suffusion, curved inwards on upper half: an interrupted blackish terminal line: cilia whitish-ochreous, with two more or less distinct fuscous shades. Hindwings in ♂ ochreous-whitish, in ♀ rather dark grey; cilia in ♂ ochreous-whitish, in ♀ whitish-ochreous with two fuscous shades.

Palni Hills, 6,000 feet (Campbell); three specimens. Very similar to *dicremna*, but differs by the yellowish antennæ ringed with fuscous, termen of forewings somewhat more sinuate and oblique, forewings in ♂ yellower and hindwings whiter, head yellower, dorsal blotch narrower and inwardly oblique instead of having anterior edge vertical, first dorsal stigma distinct.

Hermogenes cryphæa, n. sp.

♀. 18-19 mm. Head ochreous-yellow, sides of face dark brown. Palpi light ochreous-yellowish, lower ¾ of second joint dark fuscous. Antennæ dark fuscous. Thorax dark fuscous. Abdomen fuscous. Forewings elongate, posteriorly dilated, costa gently arched, apex obtuse, termen nearly straight, somewhat oblique; 7 to costa; purplish-fuscous irrorated with dark fuscous: extreme costal edge yellowish posteriorly; discal stigmata cloudy, dark fuscous, first connected with dorsum beyond middle by an oblique fascia-like patch of dark fuscous suffusion: faint traces of a curved darker subterminal streak: cilia whitish-ochreous with two dark fuscous shades. Hindwings fuscous; cilia whitish-ochreous, with two fuscous shades.

Khasis; three specimens.

Amphitrias, n. g.

Head with loosely appressed hairs, side tufts spreading; ocelli absent; tongue developed. Antennæ ¾, in ♂ with long ciliations (4). Labial palpi very long, recurved, second joint thickened with somewhat projecting scales beneath, terminal joint as long as second, acute. Maxillary palpi rudimentary. Posterior tibiæ clothed with rough hairs. Forewings with veins 2 and 3 approximated from angle, 4 absent, 7 and 8 stalked, 7 to termen, 11 from middle. Hindwings somewhat over 1, oblong-ovate, cilia ½; 4 absent, 5 approximated to 3, 6 and 7 stalked.

Amphitrias cynica, n. sp.

♂ ♀. 17-21 mm. Head, thorax, and abdomen ochreous-whitish. Palpi white, second joint fuscous except towards apex. Antennæ in ♂ grey, in ♀ whitish. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen slightly sinuate, oblique; ochreous-whitish; usually some scattered irregular pale fuscous irroration or suffusion, especially beyond cell and towards tornus; discal stigmata dark fuscous: a row of blackish marginal dots round apex and termen: cilia ochreous-whitish. Hindwings and cilia ochreous-whitish.

Patipola and Maskeliya, Ceylon, from February to May (Alston, Pole); six specimens.

Epimactis talantias, n. sp.

♂ ♀. 14-19 mm. Head white, side tufts drawn into a central tuft. Palpi white, lower half of second joint infuscated, extreme tip of terminal joint blackish. Antennæ grey. Thorax white, finely sprinkled with pale ochreous. Abdomen pale whitish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen obliquely rounded; white, in ♂ thinly, in ♀ more closely irrorated with fine fuscous or pale fuscous specks; stigmata black, plical obliquely beyond first discal; a row of black dots immediately before margin round apical portion of costa and termen to tornus: cilia white, with a few fuscous specks. Hindwings grey-whitish, apex slightly greyer: cilia whitish.

Matale and Kandy, Ceylon, in August, November, December, and March (Pole); six specimens.

Odites, Wals.

I think it best to sink *Myriopleura* and *Trichernis* as synonyms of this genus, the distinctive characters appearing unsatisfactory in the light of increased material. Ten additional species are now described.

Odites praetoria, n. sp.

♂ ♀. 15-18 mm. Head, thorax, and abdomen whitish-ochreous. Palpi ochreous-whitish, lower ⅔ of second joint fuscous, base of terminal joint dark fuscous. Antennæ grey, ciliations in ♂ 3. Forewings elongate, moderate, costa gently arched, apex round-pointed, termen sinuate, oblique ; 2 from ⅝ ; whitish-ochreous, more or less sprinkled with fuscous and a few black scales ; a black basal dot in middle, and base of costa black ; a black dot beneath costa at ¼ ; stigmata small, black, plical obliquely beyond first discal ; a triangular blackish spot on costa before middle ; three small spots of dark fuscous suffusion on costa posteriorly, from first of which proceeds an angulated or strongly curved series of small spots of dark fuscous irroration to dorsum before tornus ; a terminal series of black dots : cilia whitish-ochreous, with a fuscous line. Hindwings ochreous-whitish, in ♀ slightly tinged with grey ; cilia pale whitish-ochreous sometimes with a faint grey line.

Khasis, in June and September ; seven specimens.

Odites glaphyra, n. sp.

♂. 26 mm. Head whitish-ochreous, sides of face brownish. (Palpi broken.) Antennæ pale brownish-ochreous, ciliations 3. Thorax pale brownish-ochreous. Abdomen whitish-ochreous. Forewings elongate, rather narrowed towards base, costa gently arched, apex round-pointed, termen sinuate, oblique : 2 from ¾ ; pale brownish ochreous, with some scattered dark fuscous specks ; extreme costal edge blackish towards base ; stigmata small, blackish, plical obliquely beyond first discal ; an angulated subterminal series of indistinct dark fuscous dots, terminating in a cloudy dark fuscous prætornal spot : a terminal series of blackish dots : cilia pale brownish-ochreous. Hindwings ochreous-whitish ; cilia whitish-ochreous.

Sikkim, in March ; one specimen.

Odites aspasta, n. sp.

♂ ♀. 23-24 mm. Head yellow-ochreous, sides of face dark fuscous. Palpi light ochreous-yellowish, lower ⅔ of second joint dark fuscous. Antennæ grey, yellowish beneath and towards base, ciliations in ♂ hardly 2. Thorax yellowish-ochreous, tinged or sprinkled with fuscous. Abdomen whitish-ochreous. Forewings elongate, narrowed towards base, costa gently arched, apex obtuse, termen straight, rather oblique ; 2 from near angle ; light yellow-ochreous, sometimes partially finely sprinkled with light fuscous ; sometimes a small black dot beneath costa at ¼ ; stigmata blackish, discal rather large, plical minute, obliquely beyond first discal ; an angulated subterminal series of small undefined spots of blackish irroration ; a terminal series of black dots : cilia whitish-ochreous. Hindwings whitish-grey, with indications of dark terminal dots ; cilia in ♂ light grey, base whitish, in ♀ ochreous-whitish with a grey line.

Khasis, in May and September ; three specimens.

Odites agraula, n. sp.

♂. 19-22 mm. Head, antennæ, thorax, and abdomen whitish-ochreous antennal ciliations 3. Palpi pale whitish-ochreous, second joint fuscous except towards apex. Forewings elongate, moderate, somewhat dilated posteriorly, costa gently arched, apex obtuse, termen hardly sinuate, rather oblique ; 2 almost from angle; whitish-ochreous, costal edge yellowish-tinged; a black dot beneath costa near base, and base of costa more or less suffused with dark fuscous; discal stigmata black, first followed by a minute black dot obliquely above it, second transversely double, upper tending to form a short inwardly oblique mark; plical stigma indicated by a few blackish scales on fold midway between discal; a patch of fuscous suffusion on costa in middle, and another before apex; sometimes indications of a fascia of fuscous irroration from central costal patch to tornus; a terminal series of undefined dark fuscous dots; cilia ochreous-whitish, basal half yellowish-tinged. Hindwings and cilia ochreous-whitish, cilia yellower-tinged.

Palni Hills, 6,000 feet (Campbell): four specimens.

Odites eriopa, n. sp.

♂♀. 16—18 mm. Head, thorax, and abdomen whitish-ochreous, thorax in ♀ fuscous-tinged. Palpi ochreous-whitish, lower ⅔ of second joint dark fuscous, extreme base and apex of terminal joint dark fuscous. Antennæ in ♂ whitish-ochreous, in ♀ fuscous, ciliations in ♂ 3. Forewings elongate, moderate, costa gently arched, apex obtuse, termen hardly sinuate, rather oblique; 2 from ⅚; whitish-ochreous, in ♂ sprinkled with fuscous, in ♀ suffused with a pale pinkish-fuscous tinge and irrorated with dark fuscous; costal edge suffused with ochreous-yellowish: discal stigmata rather large, round, black: cilia pale yellowish, sometimes with an indistinct fuscous line. Hindwings ochreous-whitish, in ♂ slightly greyish on margins, in ♀ tinged with light grey throughout; cilia whitish-yellowish, in ♀ greyish-tinged.

Khasis, in July and August; six specimens.

Odites centrias, Meyr.

Described from Burma, but common in India and Ceylon; the description may be enlarged in the following particulars: ♂ ♀. 14—19 mm.; forewings often almost whitish, veins usually more or less distinctly lined with fuscous, most strongly in palest specimens; characteristic black dot on origin of veins 4 and 5 always conspicuous. Occurs in Khasis, Nilgiris, Coorg, Bombay; Haputale, Maskeliya, Diyatalawa, and Madulsima, Ceylon; from April to December.

Odites gomphias, n. sp.

♂ ♀. 15—23 mm. Head and palpi ochreous-whitish, second joint of palpi more or less infuscated except towards apex, terminal joint posteriorly clothed in ♂ throughout, in ♀ towards middle with loose expansible hairscales. Antennæ and abdomen whitish-ochreous, antennal ciliations in ♂ 5. Forewings elongate, costa moderately arched, apex obtuse, termen slightly sinuate, little oblique; 2 from angle; ochreous-whitish; an oblique black interrupted line in disc marking end of cell; undefined streaks of ochreous or fuscous suffusion round upper and posterior margins of cell, beneath costa posteriorly, from discal mark to middle of termen (sometimes double), and an oblique streak from dorsum towards base; a blackish mark on costal edge before apex, and one on middle of termen: cilia pale whitish-ochreous, more or less marked with fuscous opposite black marginal marks. Hindwings and cilia ochreous-whitish.

Maskeliya, Maturatta, Puttalam, and Eppawela, Ceylon; in March, September and November (Pole, Green, de Mowbray); five specimens.

Odites encarsia, n. sp.

♂. 16—17 mm. Head ochreous-whitish. Palpi whitish, lower half of second joint fuscous. Antennæ pale ochreous, ciliations very short ($\frac{1}{4}$). Thorax and abdomen whitish-ochreous. Forewings elongate, costa moderately arched, apex obtuse, termen nearly straight, rather oblique; 2 from angle; whitish-ochreous, some veins indistinctly streaked with pale yellow-ochreous; an oblique patch of pale brownish suffusion from dorsum near base to fold; an oblique blackish linear mark crossing end of cell, followed by some brownish suffusion tending to extend itself along veins: cilia whitish-ochreous. Hindwings and cilia ochreous-whitish.

N. Coorg, 3,500 feet, in May (Newcome): two specimens. Much like the preceding, but structurally distinct.

Odites orthometra, n. sp.

♂ ♀. 16—18 mm. Head and thorax whitish-ochreous, in ♀ suffused with pale brownish-ochreous. Palpi ochreous-whitish, lower $\frac{2}{3}$ of second joint fuscous, extreme base of terminal joint dark fuscous. Antennæ grey, beneath and towards base whitish-ochreous, ciliations in ♂ 2. Abdomen greyish. Forewings elongate, rather narrowed towards base, costa slightly arched, apex obtuse, termen nearly straight, rather oblique; 2 from $\frac{5}{6}$; whitish-ochreous, in ♀ tinged with brownish-ochreous and irrorated with brownish; stigmata blackish, first discal rather large, plical obliquely beyond first discal; a strongly curved subterminal series of minute black dots, central dot enlarged and conspicuous; a series of minute indistinct blackish dots on posterior part of costa and termen? cilia whitish-yellowish. Hindwings pale grey; cilia pale grey, base whitish-yellowish.

Maskeliya, Ceylon, in April (Pole), one ♂ (type); Khasis in August, one ♀.

Odites sphendonistis, n. sp.

♂. 14 mm. Head and thorax whitish-ochreous suffused with light fuscous. Palpi ochreous-whitish, second joint suffused with rather dark fuscous, terminal joint with basal and median undefined dark fuscous rings. Antennæ serrulate ochreous-whitish, basal joint dark fuscous, ciliations minute but distinct ($\frac{1}{4}$). Abdomen greyish-ochreous, segmental margins and anal tuft whitish-ochreous. Forewings elongate, posteriorly slightly dilated, costa moderately arched, apex obtuse, termen straight, little oblique; 2 from near angle; light greyish-ochreous suffusedly irrorated with fuscous; a blackish basal dot in middle, and one on base of costa; stigmata rather large, black, plical slightly beyond first discal; a row of blackish dots along posterior part of costa and termen to before tornus: cilia pale greyish-ochreous. Hindwings and cilia grey.

Puttalam, Ceylon, in September (Pole); one specimen.

Odites mistharna, n. sp.

♂ ♀. 11—14 mm. Head and thorax light brownish-ochreous. Palpi whitish-ochreous, second joint sometimes somewhat infuscated and with an indistinct fuscous subapical ring, extreme base of terminal joint dark fuscous. Antennæ pale ochreous, in ♂ serrulate, ciliations hardly perceptible. Abdomen grey apex whitish-ochreous. Forewings elongate, costa gently arched, apex obtuse, termen nearly straight, rather oblique; 2 from near angle ; light brownish-ochreous, more or less irrorated finely with brown or fuscous ; a black dot on base of costa ; stigmata blackish, discal rather near together, plical directly beneath first discal · a row of blackish dots along posterior part of costa and termen to before tornus : cilia light brownish-ochreous, tips paler. Hindwings grey : cilia light grey, with darker basal shade.

Puttalam and Trincomali, Ceylon, from June to September (Pole, Fletcher); five specimens.

Procometis trochala, n. sp.

♂ 21 mm., ♀ 35 mm. Head and thorax brownish. Palpi whitish-ochreous, mixed with brownish, second joint loosely haired above, terminal shorter. Antennæ fuscous. Abdomen brownish, segmental margins whitish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, termen rounded, rather strongly oblique ; brown, in ♂ slightly, in ♀ suffusedly sprinkled with dark fuscous, especially in disc and towards termen, costa suffused with dark fuscous, except towards base, more broadly in ♀; discal stigmata obscurely indicated by dark fuscous suffusion, second tending to be transversely double : cilia pale fuscous sprinkled with dark fuscous. Hindwings in ♂ much narrower than in ♀, narrower than forewings, whitish-ochreous slightly tinged with fuscous posteriorly, with ochreous-yellowish costal hair-pencil, cilia very long, at tornus over 1, whitish-ochreous ; in ♀ dark fuscous, suffused with whitish towards base, cilia whitish.

Pusa, Bengal, bred in June from larvæ feeding on dried leaves of sugarcane (Maxwell-Lefroy); two specimens. This does not differ essentially from the Australian species of the genus except in the shorter palpi with second joint more thickened with scales and roughened above.

Acria, Stph.

This genus, to which my attention was kindly called by Mr. T. Hartley Durrant, supersedes *Amphoritis* Meyr., and the type-species, *A. emarginella* Don., supersedes my *camelodes*.

Acria eulectra, n. sp.

♂. 16 mm. Head ochreous-white. (Palpi broken.) Antennæ whitish ringed with blackish. Thorax fuscous, shoulders ochreous-white. Abdomen yellow-whitish. Forewings elongate, moderate, costa moderately arched, subsinuate in middle, with rough projecting scales on each side of sinuation causing it to appear as an excavation, apex rounded-obtuse, termen rounded, little oblique ; ochreous-white; a suffused fuscous patch extending along dorsum from base to ⅔, narrowed posteriorly, obscurely interrupted in middle; a round patch in middle of disc irregularly mixed with fuscous and blackish; undefined dark fuscous costal strigulæ on each side of sinuation, second giving rise to an angulated undefined line of dark fuscous and blackish scales ending in a small spot before tornus ;

some slight brownish suffusion beyond this on lower half ; a series of minute dark fuscous dots on posterior part of costa and termen : cilia ochreous-white. Hindwings fuscous, somewhat thinly scaled, suffused with dark fuscous posteriorly ; cilia yellow-whitish, with faint traces of a fuscous line.

Khasis, in December : one specimen.

Acria xanthosaris, n. sp.

♂. 16-18 mm. Head whitish, crown tinged or suffused with light fuscous. Palpi white, second joint with upper longitudinal half suffused with light fuscous, terminal joint with fuscous supramedian ring. Antennæ dark fuscous. Thorax reddish-fuscous. Abdomen golden-yellow. Forewings elongate, moderate, costa moderately arched, subsinuate in middle, with rough projecting scales on each side of sinuation causing it to appear as an excavation, apex obtuse, termen slightly rounded, somewhat oblique ; pale reddish-grey irrorated with reddish-fuscous ; a cloudy dark grey spot on dorsum at ¼ ; cloudy dark grey marks on costa at ⅓ and before and after sinuation : stigmata minute, dark fuscous, inconspicuous, plical rather obliquely beyond first discal ; an indistinct angulated dark grey line from beyond costal sinuation to before tornus ; a series of dark grey dots on posterior part of costa and termen : cilia ochreous-whitish tinged with reddish, basal half reddish-grey bounded by a dark grey shade. Hindwings fuscous, rather darker posteriorly ; cilia whitish-fuscous, on dorsum paler and sometimes yellowish-tinged ; undersurface with a subcostal pecten of pale yellowish hairs from base to near middle.

Khasis, in December ; two specimens. Specially distinguished by the yellow pecten of hindwings.

Acria ceramitis, n. sp.

♂ ♀. 16-19 mm. Head and thorax fuscous, face whitish. Palpi white, second joint sprinkled with grey except on projecting scales, terminal joint with dark grey supramedian ring. Antennæ grey. Abdomen light fuscous, in ♂ tinged with yellow-ochreous. Forewings formed as in *xanthosaris* ; fuscous or grey, usually partially tinged with reddish ; costal edge in sinuation usually more or less reddish-ochreous ; stigmata minute, dark fuscous, often obsolete, plical somewhat beyond first discal ; an angulated subterminal series of indistinct dark fuscous cloudy dots, often obsolete : cilia greyish-ochreous tinged with reddish, basal third dark grey. Hindwings fuscous, sometimes ochreous-tinged, darker towards apex ; cilia whitish-fuscous.

Palni Hills (Campbell) ; Khasis, in June ; seven specimens. I have also four specimens from Maturatta, Peradeniya, Maskeliya and Haputale, Ceylon, in February, and from June to September (Pole, Green, Alston), which are probably the same species, but differ in being usually darker-coloured, forewings sometimes dark fuscous with slight purplish tinge, hindwings dark fuscous, sometimes with coppery tinge, head, palpi, and part of costa and cilia of forewings more or less conspicuously yellowish-tinged. I do not find any reliable distinction.

Aolanthes Meyr.

Vein 9 of forewings is sometimes stalked with 7 ; this character occurs exceptionally in *callidora*, but is normal in some of the following species. In hindwings 6 and 7 are sometimes approximated only.

Æolanthes dicræa, n. sp.

♂. 20-22 mm. Head and thorax whitish-yellowish mixed with ferruginous-ochreous. Palpi yellow-whitish, second joint except apex, and a median band of terminal joint ferruginous-yellow irrorated with dark fuscous. Antennæ and abdomen whitish-ochreous. Forewings suboblong, costa anteriorly moderately, posteriorly slightly arched, roughened with projecting scales before middle, apex obtuse, termen slightly rounded, rather oblique ; 8 and 9 out of 7 ; white, towards costa irregularly suffused with pale yellowish ; basal third of costa ferruginous-yellow ; a ferruginous subcostal dash before middle ; an elongate patch of yellow suffusion in middle of disc ; a reddish-brown dorsal patch extending from base to near tornus, and reaching nearly half across wing, containing a triangular dark reddish-brown dorsal spot at ⅔, partially whitish-edged ; a ferruginous-yellow suffusion along posterior half of costa, with a black mark beneath it near apex ; veins 5 and 6 marked with reddish-brown lines becoming blackish posteriorly, vein 4 less distinctly lined with brownish ; between veins 5-7 two light ferruginous-brown streaks, sometimes partially yellowish-suffused, between 4 and 5 a yellowish streak, and on tornus a deep yellow elongate patch ; a fine blackish line along termen : cilia whitish-yellowish, on costa yellow-ferruginous. Hindwings grey, apex sometimes suffused with whitish-yellowish ; cilia whitish-yellowish, suffused with light grey except round apex.

Khasis, in November and April , two specimens.

Æolanthes siphonias, n. sp.

♂ ♀. 22-29 mm. Head and thorax pale ochreous mixed with brownish, face whitish. Palpi whitish, second joint except apex, and a median band of terminal joint yellowish, irrorated with ferruginous-brown. Antennæ whitish-ochreous. Abdomen whitish-yellowish, in ♀ greyish-suffused. Forewings formed as in *dicræa* ; 8 and 9 out of 7 ; whitish ; a fine oblique ferruginous line from ⅓ of costa to upper margin of cell ; a ferruginous line beneath posterior half of costa ; posterior margin of cell and veins 3-9 marked with fine ferruginous-brown lines ; a ferruginous-brown patch along dorsum from base, terminating in a triangular spot before tornus, of which first half is dark ferruginous-brown edged anteriorly with whitish and posteriorly with black second half dark fuscous ; a fine blackish terminal line : cilia yellow-whitish, sometimes with one or two faint ferruginous lines. Hindwings in ♂ pale ochreous-yellowish, dorsal half suffused with pale greyish, in ♀ light grey ; cilia yellow-whitish, in ♂ greyish-tinged.

Simla, in July ; nine specimens. A ♂ from Koni, Burma, in October (Manders), has base of forewings tinged with bright ferruginous, disc yellowish-tinged, subcostal ferruginous line obsolete, posterior margin of cell marked with a curved dark ferruginous mark enclosing a fine white lunule, and followed by an ovate pale yellow spot indistinctly edged posteriorly with ferruginous whence the dark veins originate, hindwings yellower and greyish towards base only, abdomen yellower ; it seems to be certainly only a local form of the same species.

Æolanthes lychnidias, n. sp.

♂. 22mm. Head and thorax pale ochreous, somewhat mixed with dark fuscous. Palpi rosy-whitish, second joint mixed with dark fuscous, terminal joint with dark fuscous basal and supramedian rings. Antennæ fuscous. Abdomen light ochreous-yellowish. Forewings oblong, costa gently arched, with rough projecting scales before middle, apex rounded, termen rounded, little oblique ; 9 separate ; pale whitish-yellowish ; basal area mixed with brown, with an orange tuft near base in middle, and a larger brown tuft mixed with dark fuscous near dorsum ; beyond this a broad undefined fascia of blackish and whitish irroration from ⅓ of costa to middle of dorsum, costal projecting scales mixed with pale rosy ; a subovate white spot in disc beyond middle outlined with black irroration and centred with a yellow spot ; beyond this a trapezoidal patch of whitish and black irroration, of which one angle rests on costa beyond middle and one projects strongly towards apex ; apical area beyond this ferruginous-brown, including a white apical spot produced along termen, its anterior edge rosy-tinged ; a tornal patch of ground-colour partially tinged with pale rosy : cilia whitish-yellowish, basal half on termen rosy-tinged and sprinkled with black, on tornus ferruginous-yellow. Hindwings and cilia pale yellowish ; 6 and 7 closely approximated towards base.

Palni Hills, in November (Campbell) ; one specimen.

Æolanthes euryatma, n. sp.

♂. 17 mm. Head and thorax bronzy-fuscous, patagia dark purplish-fuscous. Palpi bronzy-fuscous irrorated with dark fuscous. Antennæ dark fuscous. Abdomen yellow-ochreous, tinged with grey towards apex. Forewings oblong, costa anteriorly moderately, posteriorly slightly arched, scales at ⅖ slightly roughened, apex obtuse, termen slightly rounded, rather oblique; 9 separate ; white, mixed towards termen with light grey and towards tornus with pale ochreous-yellowish ; two dark fuscous patches mixed with deep indigo-purplish and blackish ; first basal, extending on costa to beyond ⅓ and on dorsum to ¾, outer edge prominent at ¾ from costa ; second subtriangular extending on costa from middle to near apex, its apex almost connected with prominence of first ; an interrupted dark fuscous terminal line : cilia whitish-yellowish, more whitish at apex and tornus. Hindwings with 6 and 7 approximated towards base ; pale yellowish, towards dorsum greyish-tinged ; cilia pale yellowish.

Khasis, in July ; one specimen.

BLASTOBASIDÆ.

Through an oversight in my last paper a species was described under the name of *pulverea* as belonging to the genus *Blastobasis* ; it is really referable to the genus *Hypatima*, like the species which follows it.

(*To be continued.*)

CEYLON FERNS IN THE BOMBAY NATURAL HISTORY SOCIETY'S HERBARIUM.

BY

E. BLATTER, S. J.

The herbarium of the B. N. H. Society contains about two-thirds of the species of Ferns known to occur in Ceylon. The specimens presented by Major Macpherson have, in many cases, been collected in places which are not mentioned in the botanical literature on the Fern-Flora of India and Ceylon. By compiling this list it is my intention to add a little to the knowledge of the distribution of the Ferns on that botanically interesting Island. I am of opinion that it is not the chief aim of a museum to amass as great an amount of specimens as possible and to lock them up in safe cases; all the information they contain ought to be made accessible to those interested in a certain branch. This applies especially to collections made and kept in India, as comparatively very few botanists are ever in a position to pay a visit to the Far East and to examine personally what material may be stored up in an Indian museum. In order to make the catalogue more complete I shall give all the information available to me regarding the distribution of the single species in Ceylon. This is not very much and is almost confined to Beddome's publications on Indian Ferns. An asterisk in the list indicates that the respective species is not represented in our herbarium; it is, at the same time, an invitation to the members of the B. N. H. Society to fill up the gaps in our collections.

I. Gleicheniaceæ.

*1. Gleichenia linearis (Burm.) Ceylon up to 6,000 ft. (Bedd.)

II. Polypodiaceæ.

*2. Cyathea sinuata (Hook. & Grev.), Singhe Rajah Forest.
3. „ hookeri (Thw.), Kandy (Macpherson), Singhe Rajah Forest. (Bedd.)
4. Amphicosmia walkeræ (Hook.) Newera Elya (Macph.), centre of the Island at the higher elevations (Bedd.)
*5. Alsophila glabra (Hook.)
6. „ crinita (Hook.) Newera Elya (Macph.), Central provinces (Bedd.)

*7. Diacalpe aspidioides (Bl.) Higher parts of Central Provinces (Bedd.)

8. Dennstœdtia scabra (Wall.) Newera Elya (Macph.), Central Provinces (Bedd.)

9. Hymenophyllum tenellum (Kuhn.) Central Provinces, 3,360 ft. (Bedd.)

10. ,, exsertum (Wall.) Newera Elya (Macph.), Central Provinces (Bedd.)

11. ,, polyanthos (Sw.). Newera Elya (Macph.)

*12. ,, ,, ,, var. blumeanum.

*13. ,, javanicum (Spreng.) Central Provinces (Bedd.)

*14. ,, neesii (Hook.) Central Provinces (Bedd.)

*15. Trichomanes motleyi (V. D. B.)

*16. ,, exiguum (Bedd.)

*17. ,, neilgherrense (Bedd.) Central Provinces (Bedd.)

*18. ,, proliferum (Blume).

19. ,, digitatum (Swartz). Ambagamwa district.

*20. ,, intramarginale (Hook. & Grev.) Ambagamwa district (Bedd.)

*21. ,, pallidum (Blume). Ambagamwa district (Bedd.)

*22. ,, bipunctatum (Poir.)

*23. ,, pyxidiferum (L.)

*24. ,, rigidum (Swartz).

*25. Humata pedata (Smith.)

*26. ,, ,, ,, var. vestita.

27. Leucostegia pulchra (Don). Central Provinces, 3,000—5,000 ft. (Bedd.)

28. ,, hymenophylloides (Blume). Malakellie, 4,000 ft. (Macph.) Ceylon, 3,000—4,000 ft. (Bedd.)

*29. Prosaptia emersoni (Presl.)

30. ,, contigua (Swartz). Newera Elya (Macph.), Central Provinces, 5,000 ft. (Bedd.)

*31. Davallia elegans (Sw.) 2,000—3,000 ft. (Bedd.)

32. ,, bullata (Wall.)

33. Microlepia platyphylla (Don.) Kandy (Macph.)

34. Microlepia majuscula (Lowe) Rangbodde, 3,500 ft. elevation (Bedd.)
35. ,, strigosa (Swartz).
36. ,, speluncæ (L.)
37. ,, ,, ,, var. rhomboidea.
38. Stenoloma chinensis (Swartz.)
39. Lindsaya cultrata (Swartz). Newera Elya (Macph.), higher altitudes of the Central Provinces (Bedd.)
*40. ,, repens (Thw.) Singhe Rajah Forest (Bedd.)
*41. ,, orbiculata (Lam.) var. tenera.
*42. ,, lancea (L.)
*43. ,, walkeræ (Hook).
44. Schizoloma lobata (Poir.) Newera Elya (Macph.)
45. ,, ensifolia (Swartz).
46. ,, heterophylla (Dry).
47. Adiantum lunulatum (Burm.)
48. ,, caudatum (L.) Kandy (Macph.)
49. ,, capillus veneris (L.)
50. ,, æthiopicum (L.)
51. ,, hispidulum (Swartz.) Up to 4,000 ft. (Bedd.), Newera Elya (Macph.)
*52. ,, flabellulatum (L.) Ouvah district (Bedd.)
53. Cheilanthes mysorensis (Wall.) Kandy (Macph.), at low elevations (Bedd.)
*54. ,, laxa (Moore), Kurunagalla and Kallupahane (Bedd.)
55. ,, farinosa (Kaulf.) Newera Elya (Macph.)
56. Pellæa concolor (Langs and Fisch.) Up to 4,000 ft. (Bedd.)
57. ,, boivini (Hook.) Matakellie 4,000 ft. (Macph.)
58. ,, falcata (Fée). Kandy (Macph.) Telgamma (Bedd.)
59. Pteris longifolia (L.)
60. ,, cretica (L.) Kandy (Macph.)
61. ,, hookeriana (Agardh.) Adam's Peak, about 2,000 ft. elevation; Southern Provinces, at low elevations (Bedd.)
*62. ,, ensiformis (Burm.)
63. ,, quadriaurita (Retz.) Newera Elya (Macph.)

64. Pteris quadriaurita (Retz.) var. ludens. Kandy (Macph.)
65. ,, patens (Hook.) Dodawilla, Matele and Mooroowa forests, above 2,000 ft. elevation (Bedd.)
*66. ,, longipes (Don.)
67. ,, aquilina (L.)
68. Campteria biaurita (L.)
69. Litobrochia incisa (Thunb.) Newera Elya (Macph.), Central and Southern Provinces, above 3,000 ft. (Bedd.)
70. ,, marginata (Bary). Kandy (Macph.), about Galle and the Central Provinces (Bedd.)
71. Ceratopteris thalictroides (L.)
72. Lomaria patersoni (Spreng.) Newera Elya (Macph.), 4,000 ft. and upwards (Bedd.)
73. Blechnum orientale (L.)
74. Doodia dives (Kunze) Hackgalla (Macph., Bedd.), Central Provinces above 4,000 ft. (Bedd.)
75. Thamnopteris nidus (L.)
76. Asplenium ensiforme (Wall.)
77. ,, normale (Don.) Above 4,000 ft. elevation (Bedd.)
78. ,, wightianum (Wall.) Newera Elya (Macph.)
79. ,, tenerum (Forst.) Oodawella and Mutale East (Bedd.), Kandy (Macph.)
80. ,, lunulatum (Sw.) var. camptorachis. Central Provinces (Bedd.)
81. ,, zenkerianum (Kze.) Newera Elya (Macph. & Bedd.)
82. ,, falcatum (Lam.)
83. ,, macrophyllum (Swartz.)
84. ,, caudatum (Forst.) Newera Elya (Macph.)
*85. ,, gardneri (Baker.)
86. ,, formosum (Willd.) Newera Elya (Macph.)
87. ,, unilaterale (Lam.)
88. ,, heterocarpum (Wall.) Newera Elya (Macph.), Central Provinces, above 3,000 ft. (Bedd.)
89. ,, laciniatum (Don.)
90. ,, furcatum (Thunb.) Newera Elya (Macph.), 5,000—7,000 ft. (Bedd.)

91. Asplenium affine (Swartz). Newera Elya (Macph.)
92. „ nitidum (Swartz). Mattakellie, 4,000 ft. (Macph.)
93. „ varians (Hook. & Grev.) Newera Elya, 7,000 ft. (Macph.), 3,000 ft. and upwards (Bedd.)
94. „ tenuifolium (Don.). Newera Elya (Bedd.)
95. „ rutæfolium (Kunze) Singhe Rajah Forest (Macph. & Bedd.)
96. Athyrium hohenackerianum (Kze.)
97. „ macrocarpum (Blume). Newera Elya (Macph.)
98. „ selenopteris (Kunze). Newera Elya (Macph. & Bedd.) Maturatte (Bedd.)
99. „ gymnogrammoides (Kl.) Newera Elya (Macph.), Central Provinces, 5,000—6,000 ft. (Bedd.)
100. „ gymnogrammoides (Kl.) var. erythrorachis (Bedd.) Newera Elya (Macph. & Bedd.)
101. Diplazium lanceum (Thunb.) Kandy (Macph.), Matale East and Saffragram, 2,000-3,000 ft. (Bedd.)
102. „ sylvaticum (Presl.) Kandy (Macph.), Central Provinces (Bedd.)
103. „ japonicum (Thunb.) Newera Elya (Macph.), Central Provinces (Bedd.)
*104. „ schkuhrii (Thw.) Central Provinces (Bedd.)
*105. „ polypodioides (Mett.)
106. „ „ „ var. decurrens. Ambagamwa (Bedd.)
107. „ latifolium (Don.)
108. „ umbrosum (J. Smith). Newera Elya (Macph.)
*109. „ „ (J. Smith) var. assimile. Central Provinces (Bedd.)
110. „ zeylanicum (Hook.) Kotmallie (Macph., Bedd.) Ambagamwa (Bedd.)
111. Anisogonium esculentum (Presl.)
*112. „ smithianum (Baker) Matale East and Oodawella, 3,000 ft. elevation (Bedd.)
*113. Allantodia javanica (Bl.)
114. Actinopteris dichotoma (Forsk.)
115. Polystichum auriculatum (L.) Newera Elya (Macph.)

116. Polystichum aculeatum (Sw.) Horton Plains, 6,000 ft. (Macph.)
117. ,, aculeatum (Sw.) var. biaristatum (Bl.) Newera Elya (Macph.)
118. ,, aculeatum (Sw.) var. anomalum (Hook.) Horton Plains and Happootalee, 5,000—6,000 ft. (Bedd.)
119. Cyrtomium falcatum (Sw.) var. caryotideum (Wall.)
120. Aspidium subtriphyllum (Hook.) Kandy (Macph.)
121. ,, polymorphum (Wall.)
122. ,, decurrens (Presl.) Kandy (Macph.)
123. ,, ,, ,, var. minor (Bedd.) Doombera district at no great elevation (Bedd.)
124. ,, cicutarium (Sw.) Kandy (Macph.)
125. Pleocnema thwaitesii (Bedd.) Southern Provinces, near Galle, on the Haycock Mountain (Bedd.)
*126. ,, trimeni (Bedd.) Central Provinces (Bedd.)
*127. ,, membranacea (Hook.) Doombera district (Bedd.)
*128. Lastrea amabilis (Bl.) Central Provinces (Bedd.)
129. ,, aristata (Sw.) Newera Elya, 7,000 ft. (Macph.)
130. ,, coniifolia (Wall.) Newera Elya, 7,000 ft. (Macph.)
131. ,, hirtipes (Bl.)
132. ,, walkeræ (Hook.) Newera Elya, 7,000 ft. (Macph.)
*133. ,, ,, ,, var. macrocarpa.
134. ,, ,, ,, var. pinnatifida. Newera Elya (Macph.)
135. ,, calcarata (Bl.) Newera Elya (Macph.)
136. ,, beddomei (Baker) Newera Elya, 5,000 ft. (Macph.)
137. ,, ochthodes (Kze.) Newera Elya, 7,000 ft. (Macph.), throughout the mountain forests (Bedd.)
138. ,, syrmatica, (Willd.) Forests of the Central Provinces (Bedd.)
139. ,, flaccida (Hook.) Newera Elya, 7,000 ft. (Macph.), highest part of the Central Provinces (Bedd.)
*140. ,, filix-mas (L.) var. elongata (Hook. & Grev.)
*141. Lastrea sparsa (Don.) Newera Elya (Macph.)
*142. ,, ,, ,, var. obtusissima (Mett.)
*143. ,, ,, ,, var. deltoidea (Bedd.)
*144. ,, ,, ,, var. minor (Thw.)

*145. Lastrea sparsa (Don.) var. zeylanica (Beedd.), Blackpool (Bedd.)

*146. ,, ,, ,, var. undulata (Thw.), Hackgalle, 5,000 ft. (Bedd.)

*147. ,, deparioides (Moore).

148. ,, thwaitesii (Baker). Southern Provinces, 2,000 ft. elevation (Bedd.)

*149. ,, crenata (Forsk.)

150. ,, blumei (Hook.) Central Provinces 2,000—3,000 ft. (Bedd.)

151. ,, dissecta (Forst.) Kandy (Macph.), up to 5,000 ft. (Bedd.)

152. ,, ferruginea (Bedd.) Newera Elya (Macph. & Bedd.)

*153. ,, boryana (Willd.) Central Provinces (Bedd.)

154. ,, tenericaulis (Wall.) 1,500—3,000 ft. (Bedd.)

155. Nephrodium otaria (Kze.) 2,000—3,000 ft. (Bedd.)

156. ,, pteroides (Retz.) Up to 3,000 ft. (Bedd.)

157. ,, extensum (Bl.) Central Provinces, 3,000—4,000 ft. elevation (Bedd.)

158. ,, cucullatum (Bl.) Kandy (Macph.), Western and Southern Provinces (Bedd.)

*159. ,, urophyllum (Wall.) Oodawella Forest (Bedd.)

*160. ,, arbuscula (Desv.) Central Provinces (Bedd.)

*161. ,, pennigerum (Bl.) Central Provinces, 2,000—4,000 ft. (Bedd.)

*162. ,, molle (Desv.) var. amboinense (Presl.) Ambagamna (Bedd.)

163. ,, truncatum (Presl.) Kandy (Macph.) Central Provinces, 2,000—5,000 ft. (Bedd.)

164. Nephrolepis cordifolia (L.) Matakellie, 4,000 ft. (Macph.)

165. ,, exaltata (L.)

166. ,, acuta (Presl.)

167. ,, ramosa (Beauv.) Matakellie, 4,000 ft. (Macph.) Central Provinces (Bedd.)

168. Oleandra musæfolia (Kunze). Matakellie, 4,000 ft.; Newera Elya, 7,000 ft. (Macph.); Central Provinces (Bedd.)

*169. Phegopteris rufescens (Blume). Central Provinces, 3,000—5,000 ft. (Bedd.)

170. Phegopteris distans (Don.) Newera Elya, 7,000 ft. (Macph.)
171. ,, punctata (Thumb.) Newera Elya (Macph. & Bedd.)
172. Polypodium parasiticum (Mett.) Newera Elya, 7,000 ft. (Macph.)
173. ,, zeylanicum (Mett.) Newera Elya (Macph. & Bedd.)
174. ,, wallii (Bedd.) Hackgalla (Macph.), Adam's Peak (Bedd.)
*175. ,, hirtellum (Bl.)
176. ,, cornigerum (Baker). Newera Elya, 7,000 ft. (Macph.), Horton Plains (Bedd.)
*177. ,, cucullatum (Nees.) Central and Southern Provinces, 3,000—5,000 ft (Bedd.)
*178. ,, glandulosum (Hook.) Central Provinces, Rambodde, and summit of Wattakelia Hill, (Bedd.)
*179. ,, thwaitesii (Bedd.) About Dickoya (Bedd.)
*180. ,, decorum (Brack.) Singhe-Rajah Forest (Bedd.)
*181. ,, fuscatum (Bl.)
182. ,, obliquatum (Bl.) Newera Elya, 7,000 ft. (Macph. & Bedd.)
*183. ,, repandulum (Mett.) Higher parts of Central Provinces (Bedd.)
184. ,, subfalcatum (Bl.) Newera Elya, 7,000 ft. (Macph.), Central Provinces (Bedd.)
185. Niphobolus adnascens (Sw.)
186. ,, pannosus (Mett.) Up to 3,000 ft. (Bedd.)
187. ,, fissus (Bl.) Newera Elya and Matakellie (Macph.), Central Provinces (Bedd.)
*188. ,, gardneri (Mett.) Central and Southern Provinces up to 3,000 ft. (Bedd.)
*189. Drynaria linnæi (Bory).
190. Pleopeltis linearis (Thunb.) Newera Elya, 7,000 ft. (Macph.)
191. ,, lanceolata (L.) Ambawalla estate (Bedd.)
192. ,, membranacea (Don.)
193. ,, punctata (L.)

*194. Pleopeltis pteropus (Bl.) var. minor.

195. ,, hastata (Thumb.) Newera Elya, 7,000 ft. (Macph.)

196. ,, phymatodes (L.) Kandy (Macph.)

197. ,, nigrescens (Bl.) Kandy (Macph.)

198. ,, dilatata (Wall.) Forests above Telgamma, 4,000 ft. (Bedd.)

199. Monogramme paradoxa (Fée). Dalosbagie (Macph.) 3,000 to 5,000 ft. elevation (Bedd.)

200. Leptogramme totta (Schl.) Newera Elya 7,000 ft. (Macph.), at the highest elevations (Bedd.)

201. Syngramme fraxinea (Don.) Newera Elya, 7,000 ft. (Macph.); 5,000—6,000 ft. elevation (Bedd.)

202. Loxogramme lanceolata (Sw.) Newera Elya, 7,000 ft. (Macph.); above Newera Elya (Bedd.)

203. ,, involuta (Don.) Newera Elya (Macph.)

204. Meniscium triphyllum (Sw.) Kandy (Macph.); Matale and Saffragam, 2,000—3,000 ft. (Bedd.)

205. ,, thwaitesii (Hook.) Kandy (Macph.), Matale 3,000 ft. elevation (Bedd.)

*206. Antrophyum reticulatum (Kaulf.)

207. ,, plantagineum (Kaulf.) Newera Elya, 7,000 ft.; (Macph.), Central Provinces (Bedd.)

208. Vittaria elongata (Sw.) Central Provinces (Bedd.)

*209. ,, lineata (Sw.) Central Provinces (Bedd.)

210. ,, scolopendrina (Presl.) Kandy (Macph.); Southern and Central Provinces up to 3,000 ft. (Bedd.)

*211. ,, sulcata (Kuhn.) 4,000—5,000 ft. elevation (Bedd.)

*212. Tænitis blechnoides (Sw.) Forests about Galle. (Bedd.)

213. Drymoglossum piloselloides (Presl.) Kandy (Macph.)

214. Hemionitis arifolia (Burm.) Kandy (Macph.)

*215. Elaphoglossum conforme (Sw.)

216. ,, latifolium (Sw.) Newera Elya (Macph.); Central Provinces (Bedd.)

*217. ,, squamosum (Sw.) Central Provinces (Bedd.)

218. ,, spathulatum (Sw.) Newera Elya, 7,000 ft. (Macph.); Southern Provinces (Bedd.)

219. Stenochlæna palustre (L.)

*220. Gymnopteris variabilis (Hook.) Newera Elya, 7,000 ft. (Macph.)

*221. „ variabilis (Hook.) var. lanceolata (Hook.)

*222. „ wallii (Baker). Southern Provinces, Mooroowa (Bedd.)

*223. „ metallica (Bedd.) Haycock mountain near Galle (Bedd.)

*224. „ spicata (L. f.)

225. „ quercifolia (Retz.) Kandy (Macph.), about Colombo (Bedd.)

226. „ contaminans (Wall.)

227. „ subcrenata (Hook. & Grev.) Central Provinces (Bedd.)

III. *Osmundaceæ.*

228. Osmunda javanica (Bl.) Newera Elya, 7,000 ft. (Macph. & Bedd.)

IV. *Schizæaceæ.*

*229. Schizæa digitata (Sw.)

230. Lygodium circinnatum (Sw.) Western, Central, and Southern Provinces, up to 2,000 ft. (Bedd.)

231. „ microphyllum (R. Br.)

232. „ flexuosum (Sw.)

V. *Marattiaceæ.*

233. Marattia fraxinea (Smith.) Newera Elya, 7,000 ft. (Macph.); Central Provinces, above 5,000 ft. (Bedd.)

VI. *Ophioglossaceæ.*

234. Ophioglossum reticulatum (L.) Newera Elya (Macph. & Bedd.)

*235. „ pendulum (L.)

236. Botrychium virginianum (L.) var. lanuginosum. Newera Elya (Bedd. & Macph.)

A CONTRIBUTION TO THE ACULEATE HYMENOPTERA OF THE BOMBAY PRESIDENCY.

BY

P. CAMERON.

(*Continued from page* 311 *of this Volume.*)

Tetralonia ovatula, sp. nov.

ck, the flagellum ferruginous, the basal joints black above, the pubescence e mesonotum and scutellum dark ferruginous, on the occiput, cheeks and anotum pale fulvous; the base of the abdomen covered with white hair: the ase of the 2nd segment with white pile, narrowly in the middle, widely on the sides, the 3rd with a much broader band, only slightly narrowed in the middle, the 4th is entirely covered with similar pubescence; the pubescence on the apical 2 stiff, black; on the ventral segments it is dark soot coloured. Wings hyaline, the nervures, costa and stigma black; the 2nd abscissa of radius longer than the 3rd—about one-fourth longer. The trochanters and femora are pale fuscous, the 4 apical joints of the hind tarsi are dark testaceous. ♀.

Length 10 mm.

Deesa. August. (Nurse.)

A broad ovate species. Clypeus punctured in the middle, the punctures clearly separated, distinct; it is almost square; the pubescence on it and on the labrum blackish. Mandibles yellowish at the base. Mesonotum and metanotum covered closely with round shallow punctures. The hair on the legs is whitish, except on the innerside of the hind tibiæ and tarsi on which it is black.

This does not appear to me to be the ♀ either of *duvancellii* or *glabricornis*; it is a broader insect than the latter, has the alar nervures black, not testaceous, the 2nd abscissa of the radius is longer than the 3rd, the opposite being the case with *glabricornis*, the clypeus is square and the apical tarsal joints much darker.

Tetralonia glabricornis, sp. nov.

Black, the flagellum of antennæ smooth, bare, shining, bright rufous, the lypeus, sides of cheeks broadly below, the lateral dilated part rounded on the uterside, labrum, base of mandibles to near the middle, and tegulæ yellow, the bescence on the pro and mesothorax and scutellum, rufo-fulvous (probably aded) the pubescence on the sides and back of the head, pleuræ and sternum ale, almost white; the pubescence on the base of abdomen pale fulvous; there a band of white depressed pile on the base of the 2nd segment, much narrowd in the middle, on the sides reaching to the middle of the segment, a much roader band on the 3rd, not narrowed in the middle, the whole of the 4th and th covered with similar pubescence; the pygidium black, bare, the sides of the egment covered with long black pubescence. Pubescence on the legs white, on he underside of the metatarsus rufous; the apical 4 tarsal joints pale testaceous. Vings hyaline, a little tinged with fulvous, the costa, stigma and nervures estaceous. ♂.

Length 10-11 mm.

Deesa. August. (Nurse.)

Antennæ as long as the body, the apical joints curved, clypeus longer than wide, coarsely, closely punctured; the labrum strongly, but not so closely punctured; the apex of the clypeus is transverse, with the sides rounded. Mesonotum punctured, but not so closely nor so strongly as the clypeus. The basal 2 abscissæ of the radius are of equal length; the 3rd is fully one-fourt longer; the 1st recurrent nervure is interstitial, the 2nd nearly so.

This does not appear to me to be *duvancelii*, Lep.; according to Bing that has the clypeus "square, very slightly emarginate anteriorly and lightly punctured," in my species it is transverse and quite strongly punctu the "6th and apical segments with fuscous pubescence;" here black; the peus in *glabricornis* is not "nearly square," but distinctly longer than wid according to Bingham, too, the thorax is more strongly punctured than the head, the reverse being the case here.

Megachile gathela, sp. nov.

Black, the head and thorax densely covered with white pubescence; the abdomen with 5 distinct white hair bands, the scopa white, wings hyaline, the stigma fuscous, the nervures blacker, the basal 2 abscissæ of the radius equal in length; both the recurrent nervures are received close to the transverse cubitals. Mandibles bidentate, both the teeth broad, the 2nd smaller than the 1st; the basal half of mandibles densely covered with white pubescence. Pubescence on legs white, that on the underside of hind metatarsus tinged with rufous. Apex of hind tibiæ one-fourth thicker than the base of metatarsus. ♀.

Length 7 mm.

Deesa. January and February.

Head wider than the thorax, the temples short. Clypeus with the sides strongly punctured, the centre almost smooth. Metanotal area strongly aciculated, the rest punctured, but not strongly. Back of abdomen closely punctured, the pygidium more closely than the rest. The fore coxæ in the ♂ are armed with a longish stout tooth, which is clearly longer than it is wide at the base. The apex of the abdomen, in the ♂, is armed with 6 irregular, not very strong pale and black teeth, the central 2 being widely separated; the part behind them is depressed. The temples are wider than they are in the ♀.

Megachile bombayensis, sp. nov.

Black, the hair on the head and thorax white, the dorsal abdominal segments narrowly banded with white pubescence, the scopa on apical half red, on basal white; wings clear hyaline; the legs for the greater part fuscous; the mandibles bluntly bidentate at the apex, the base broadly dilated in the middle; base of hind metatarsus two-thirds of the width of the apex of tibiæ. ♀.

Length 8 mm.; breadth 3 mm.

"Bombay."

Head slightly wider than the thorax, closely strongly punctured, the face smooth, shining and bare in the middle; the clypeus not much wider than long, a smooth, irregular line he centre above, its apex transverse. Base of mandibles thickly covered with depressed white pubescence; shining and bearing scattered punctures; there is a testaceous space behind the teeth. Except on the underside of the fore tarsi, where it is fulvous, the pubescence on the legs is white; the calcaria whitish. The back of abdomen is closely punctured all over; there are no distinct transverse furrows. The 2nd transverse cubital nervure is not quite interstitial; tegulæ fuscous; nervures black. ♀.

Comes near to *M. hera*, Bing. and *M. chlorigaster*, Cam.

Megachile liss poda, sp. nov.

Black, the hair on the head, upper par of thorax and the scopa, white, the pubescence on the pleuræ soot-coloured the hair on the legs grey, that on the underside of the fore metatarsus mixed wi h golden; wings fuscous-hyaline to the 2nd transverse cubital nervure, alm t hyaline beyond it. Mandibles bidentate, the upper tooth broad, rounded, ojecting slightly beyond the lower, which is almost transverse; the 2 at their ju tion are separated by a depression; the basal half of the mandibles closely punc ed and opaque, the apical smooth and shining. ♀.

Length 11 mm.

'Bombay."

Head and thorax closely, distinctly punct l. Base of hind tarsi less than half the width of the apex of tibiæ; the urs black, slender on apical half, gradually narrowed to a sharp point. He d arly as wide as the thorax. The 2nd transverse cubital nervure is almost in rstitial. Underside of flagellum piceous. The tarsi are rather long and slend The transverse bands of white pubescence on the dorsal abdominal segmen are narrow, but distinct. The punctures on the mesonotum run into transv se striæ. Face broadly roundly convex. Clypeus short, its apex broad, tra verse; the front with a narrow smooth keel between the antennæ.

In Bingham's arrangement this species comes ear to *M. cephalotus*, Sm.; that species from the description should be differ *e. g.* the mandibles are called "long, narrow and curved" (no mention is mad f the form or number of their teeth) terms which certainly do not fit those ie present species, in which they are broad both at the base and apex; tl ead is "broader than the thorax," while in *lissopoda* it is certainly not so. The colour of the wings is not stated by Col. Bingham, but Smith (Cat. m. i, 179) calls them subfuscous, hyaline towards their base," the exact op te being the case with the species I have described above.

Megachile cathena, sp.

Black, the pubescence and ventral scopa white, t uncturation distinct and close, strongest on the apex of the abdomen; wing aline, the nervures and stigma black, the 1st recurrent nervure received a y behind the middle of the cellule, the 2nd near the apex, but clearly se ed from the transverse cubital. Mandibles bidentate, the teeth distinct, the 2nd small compared with the 1st, clearly separated; the part behind them testaceous, covered with golden pubescence, the basal part thickly with y. Head large, as wide as the thorax, the occiput rounded inwardly, not transverse. Apex of clypeus transverse, depressed. Base of metanotum forming a distinct border. The pubescence on the front, face and clypeus is dense. The calcaria are black. Base of hind metatarsus half the width of the apex of tibiæ, the pubescence on the lower side of the metatarsus is white.

Length 3 mm. ♀.

This little species comes close to *I. nicevillii*, Cam.; the latter is a larger species, it has the apical tooth of the mandibles distinctly longer than its width at the base, while in the present it is not much longer than the basal width; it wants the clearly defined margined border on the top of the metanotum and the 1st recurrent nervure s received nearer the base.

Megachile *ratodonta*, sp. nov.

Length 6-7 mm. ♂.

Deesa. January.

Very similar in size and colo tion to *M. gathela*, described above; but
easily separated from it by the onger mandibular teeth, there being also,
instead of a broad rounded swe g behind the 2 apical teeth, a large, clearly
separated tooth, which is distin larger than either of the apical ones; while
the abdominal teeth are much l er, clearly defined and black. Of the latter
there are 4 distinct ones, the entral being longer, broader and much more
clearly separated than the oute cutside the latter there is a smaller, less
distinct tooth. There are 2 st t teeth on the fore coxæ. Base of hind
metatarsus not half the width of ex of tibiæ, the spurs pale. Wing nervures
and stigma black. Metanotal ar closely aciculated.

Megac *e coelioxysides*, Bing.

Col. Nurse has briefly char erized the ♂ of this species in the Journal,
Asiatic Society of Bengal, LX 1901, p. 150. It may be useful to describe
the anal segment more fully. the centre are 2 widely separated teeth, the
space between them forming micircle; on either side of this are 2 shorter
sharp teeth with a slight st y one beyond them; all these teeth have the
apices testaceous. Probably e tooth vary in length and thickness. The
mandibles are broad, biden , the teeth triangular, the apical much larger
than the other; the basal p s broadly, but not much, dilated in the centre;
the puncturation on the ba art is coarse.

Megachi *bfuscus* (Nurse, M.S.), s.p. nov.

Black, the hair on t ront, top of thorax and base of abdomen pale
rufo-fulvous, that on t est of the head and thorax much paler, the
apices of the 2nd to 4 abdominal segments with bands of pale fulvous
pubescence, the hair he apical 2 segments black, the hair on the
legs white, except on underside of the posterior metatarsus, where
it is bright rufous. s hyaline, the apex slightly, broadly infuscated,

all the coxæ and the base of fore femora black; flagellum of antennæ rufous, darker above. Wings clear hyaline, costa and nervures black, the stigma dark testaceous, tegulæ rufo-testaceous. ♀

Length 6 mm.

Deesa. December.

Head distinctly broader than the thorax. Mandibles bidentate, the apical long, gradually narrowed to a sharp point, the subapical broad at the base gradually narrowed to a point at the apex, short, broader at the base than it is long; from it there is a broad shallow curve to the base; the teeth appear broader than usual and are covered with white pubescence at the base. Head closely punctured; the clypeus with a smooth line in the centre broadest above. Thorax closely punc ured; metanotal area aciculated. The apical ventral surface is darker colou ed than the rest. Base of hind metatarsus about one-fourth narrower tha the apex of tibiæ. There are no depressions or f ws on the back of abd men, which is roundly convex. The 1st recurr vure is
received short y beyond the apex of the basal fourth; the 2nd ne ex.
Tegulæ pale te taceous.

In one exan le the back of the abdomen is brownish for the
in another the gments are only brownish under the pile.

Megachile erythrostoma, sp. nov.

Black, the ap of clypeus broadly, the mandibles broadly at
the femora and biæ more or less in front, rufous; the great
flagellum piceou he hair on the thorax, upper part of abdo
white, the ventr. copa bright red; wings clear hyaline, the
Mandibles large, dentate, the apical tooth long, bluntly narro
somewhat broa rounded; the 2nd large, clearly separated
the apex roundly rrowed, longer than it is wide at the base; th
broader, not so o e and turned inwardly. Apex of clypeus b
Puncturation of and thorax fine and close, that on the scu
than on the mes um; that on the abdomen is still finer
becomes graduall rowed towards the apex, which forms a
point; the latter fous at the apex; there are no distinct tr
or depressions on orsal surface. ♀.

Length 11 mm.

Deesa.

The mandibles a ger than usual and more particularly
especially as regar length compared with the width a
abdomen, too, bec more distinctly narrowed from the
Base of hind tarsi h width of tibiæ.

Megachile suavida, sp. nov.

Black, the mandil cept the teeth, pale yellow; flagell
part reddish, the hin ra and tibiæ except above and
the hair on the head orax long and dense; all the at

nce on the apex ; the basal ventral seg-
he nervures black ; tegulæ piceous. ♂.

tooth long, narrowed gradually towards the
; the subapical one short, broad, bluntly rounded.
nd thorax close, distinct ; that on the scutellum is
he mesonotum. Abdominal puncturation finer than
close. Apical abdominal segment broadly rounded ; its
d with a long tooth, which becomes gradually narrowed
e apex. Coxæ unarmed. Antennæ stout, not much longer
Head large, slightly wider than the thorax. Radial cellule
rp angle ; the 2nd recurrent nervure distinctly distant from the
ital, it being separated from it by about the same distance as is
e base of the cellule. Probably the amount of rufous colour
the abdomen varies ; it is more conspicuous on the sides than
. The forelegs may be more or less rufous at the base ; the
ed.
o *M. phaola* Cam. and *M. elfroma* Cam., but is larger, stouter and
æ much shorter.

Megachile ? anonyma, sp. nov.

derside of the flagellum brown, the hair on th ead and thorax
e abdominal segments with distinct bands of te pubescence ;
he mandibles broadly and the greater part the tarsi rufo-
gs hyaline, the stigma testaceous, the nervur larker coloured ;
nt nervures distinctly separated from the nsverse cubitals,
lely separated from the 2nd than is the from the basal,
en 3-dentate, the central tooth broad, squ the lateral much
orter, somewhat triangular. Mandibles tate, the apical
arp-pointed at the apex, the subapical w longer than the
edge slightly rounded inwardly, clearly se d behind. Head
ly punctured, the metanotum at the smooth, shining,
ansverse. Middle of mandibles broadly -testaceous, their
ered with white pubescence. Forele narmed. Calcaria
turation on the abdomen becomes stro towards the apex ;
tace it is strong and close, especially o basal half. The
the greater part rufo-testaceous, as so the tarsal spines.
ceous. ♂.

r.
he following note attached to this : " I have carefully
arts with the microscope and find abial palpi 4-jointed
pi 4-jointed, so it cannot be a M ." Apart from this

I cannot separate it from the latter genus. Its generic location may, in the meantime, be left over, until the ♀ has been discovered.

Thaumatosoma testaceicorne, sp. nov.

Black, the antennæ except the scape and apical joint testaceous, darker above, the pubescence dense and white, the puncturation strong and close ; the apical abdominal segment curved downwards, entire, broadly rounded, the outer edges straight, oblique ; metanotum roundly convex, smooth, shining, bare, the base with a striated border, keeled before and behind and much widened laterally. Basal segments of abdomen testaceous below. The pubescence on the lower part of the head is much longer and denser than elsewhere, especially behind. The hair on the underside of the apex of the 4 posterior tibiæ and, to a less extent, on the anterior, is long and dense, as it is also on the base of the tarsi. Mandibles with the apical tooth distinctly separated ; there is no distinct subapical one. The joints of the flagellum to the flattened apical one are of equal thickness ; the last is long, dilated and flattened. First recurrent nervure interstitial ; the 2nd received near the apex. ♂.

Length 7 mm.

Matheran, May (Nurse).

There are 2 points in which the known Indian *Thaumatsoma* (*T. burmanicum*, Bing.) differs from that here described : the apex of the abdomen ends in a longish central and a smaller lateral tooth and the 4 sub-apical joints of the antennæ are attenuated and filiform as compared with the preceding joints.

Ceratina spilaspis, sp. nov.

Green, the abdomen dark brown, the following parts bright yellow : clypeus, labrum, mandibles, except at the apex, underside of scape, a line on the pronotum uniting with the tubercles, the latter, tegulæ, a mark on the sides of the scutellum, post-scutellum broad lines on the sides of the 2nd and 3rd segments at the base, straight and twice the width of the central part, a narrow, almost continuous line on the 4th, a broad, curved one on the 5th roundly narrowed in the middle on the 5th, the apex of the femora narrowly, the tibiæ and the tarsi, bright lemon-yellow, the hind tibiæ broadly black at the apex ; the hair white on the body and legs ; wings clear hyaline, the nervures, costa and stigma pale yellow. ♂.

Length 6 mm.

Deesa, April.

Underside of flagellum pale brown or fulvous. Clypeus with a few strong punctures in the centre ; the face more finely and more closely punctured Mesonotum finely, closely punctured ; there is a distinct furrow on the side opposite the tegulæ, the scutellum bears scattered punctures in the centre ; base of metanotum is much more strongly, regularly and closely punctured apical slope is smooth. Abdomen shining, impunctate. There are 2 obs lines on the apex of the clypeus,

This species is not unlike *C. divisa*, Cam.; the latter may be known by the transverse yellow line on the apex of the mesonotum, by the lines

4th abdominal segment being much thicker and distinctly interrupted in the middle and by that on the 5th being much wider, it clearly extending beyond the middle of the segment, it being also not so distinctly narrowed in the middle.

Nomia abuensis, sp. nov.

Black, the pubescence cinereous, almost white, the apices of the abdominal segments with white pubescent bands, the basal metanotal area irregularly striated, the centre with a ʌ—shaped area with a keel down the centre; wings almost hyaline, highly iridescent, the stigma dark testaceous, the nervures darker coloured; tegulæ blackish on inner half, pale testaceous on outer. ♀.

Length 6 mm.

Abu (Nurse).

Head closely, strongly punctured, the punctures stronger on the sides of the vertex than elsewhere. Face broadly raised in the centre. Mesonotum and scutellum closely and much more finely punctured than the head; the pronotum densely covered at the base with white pubescence; it is raised at the base, the basal slope being bare; the pubescence extends along the top to the tegulæ. Post-scutellum densely covered with white pubescence. Metanotum wrinkled; it has a somewhat steep slope; it is weakly keeled down the centre and on the outer edges. Pleuræ alutaceous. Flagellum brownish red below. Apical joints of tarsi rufous. 2nd cubital cellule not much longer along the transverse cubitals than it is along the radius; 2nd abscissa of radius about one-fourth shorter than the 3rd.

Nomia collina, sp. nov.

Length 7 mm. ♀.

Mount Abu.

This species is very close to *N. abuensis*; the differences can be best shown in synoptical form.

Base of metanotum with a crenulated area; 2nd cubital cellule wide, 3rd abscissa of radius about one fourth longer than 2nd, the 2nd transverse cubital nervure straight. ... ... *Abuensis*.

Base of metanotum without a crenulated area; 2nd cubital cellule narrow, 3rd abscissa of radius 4 times longer than 2nd; the 2nd transverse cubital nervure curved ... ... *Collina*.

Metanotum opaque, alutaceous, neither the centre nor the sides are keeled; the apex of the basal area is prolonged in the centre into a sharp point; head, pro-and mesothorax closely, not very strongly punctured; the puncturation on the face and clypeus runs into obscure reticulations; there is an impressed line n the centre of the front, running into the top of the face. Tegulæ pale estaceous, darker coloured on the innerside. Abdomen fully longer than the ead and thorax united; the basal segment is covered at the base with white bescences; the apices of the segments with bands of white depressed pile. s of tarsi rufous. Middle of face not distinctly raised.

Cœlioxys latus, sp. nov.

hort, wide compared with the length, the clypeus, the greater part of the nd front, outer orbits, collar, spot in centre of mesonotum at the base.

a spot behind tegulæ, 2 spots at base of scutellum, apical slope of scutellum, pleuræ, the sides of 1st abdominal segment, the apices and bases of the segments narrowly, their sides widely, a spot in the centre of the 1st ventral and the apices of the others widely covered with white pubescence, as are also the greater part of the legs. Wings hyaline, tinged broadly with violaceous at the apex. ♀.

Length 8 mm.

Matheran, March.

Scutellum broadly rounded posteriorly, the teeth stout, bluntly pointed broader laterally than above. Ventral plate of apical segment large, spoon-shaped, with a broad rounded upper border, keeled on the inner edge. The apex of the apical dorsal segment is strongly, coarsely punctured, depressed and with a smooth, stout keel in the centre of the depression. There is a transverse, somewhat broad keel near the apex of the 2nd and 3rd segments, bordered before and behind by a smooth, shallow furrow. Frontal keel broad, smooth on lower half only.

Puncturation on the head strong and close, on the scutellum it is closer, running into reticulations. The apical ventral segment projects half the length of the dorsal beyond the apex of the latter. The part between the broad frontal keel and the ocelli is depressed.

In Bingham's key this little species would come into A, *b*, ; it cannot be confounded with *fuscipennis* or *angulatus*.

REVIEW.*

"The Plagues and Pleasures of Life in Bengal" is one of those popular books on natural history which in the last generation would not have paid their printing expenses but are now multiplying year by year at a rate that indicates, in a striking manner, the change which has come about in the mental attitude of the reading public everywhere towards "Nature study." One is sometimes tempted to think that in England the thing is being overdone. The continuous stream of books of this kind which issues from the British publishing houses, all beautifully printed, handsomely bound and superbly illustrated, but of very unequal merit, is overlaying the subject. One cannot see the wood for the trees. In India as yet there are none too many and every new comer is sure of a kindly reception. The author of the book under review is not, however, a stranger. It is only four years since Lieut.-Colonel D. D. Cunningham gave us, under the title "Some Indian Friends and Acquaintances," a pleasant volume of chatty discourses upon the beasts, birds and reptiles to be seen in Calcutta and its immediate neighbourhood, which was full of the fruits of close and sympathetic observation. The present volume carries the same strain down into the invertebrate ranks of the animal kingdom. In short, it is a book about the "poochies" of Bengal: these are the Plagues and Pleasures. It is not a scientific work and does not pretend to be, but a notice of it will surely not be out of place in the Journal of a Society of which it may be said, without fear of contradiction, that its greatest and most successful work has been to foster and diffuse a general interest in the fauna and flora of India.

The popular treatment of science need not be unscientific, for all intelligent records of fact are of value if their accuracy is assured, whether couched in technical terms or in the language of common speech. Tried by this test, Colonel Cunningham's book proves to be like the feet of Nebuchadnezzar's image, "part of iron and part of clay." He is unquestionably a close and curious observer of nature and he appears to have been also, for nearly thirty years, a most industrious recorder, not only of facts, but also of the reflections suggested by them; so that he is not dependent now on a treacherous memory. All this and more makes itself evident to the reader before he has gone through many pages of the book But it also becomes evident that the subjects treated of embrace some of which the author has a well-grounded knowledge and some of which he has no knowledge at all. When writing of plants and trees he calls them by their botanical ames and reveals an easy familiarity with all the technicalities of botanical scription; but when he turns to insects, the absence of scientific names and of en the most elementary acquaintance with classification is the more striking by trast. Familiar wasps are described as "a brilliantly metallic creature" and elatively large insect, clothed in a suit of rich, warm brown and with a brilliant w head." So minute and exact, nevertheless, are his descriptions of their

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agues and Pleasures of Life in Bengal by Lieut.-Colonel Cunningham, C.I.E., F.R.S.—Murray, Albemarle Street, London.

clay nests and their manner of constructing and stocking them that it is often easy for one who knows anything of them to identify them : but to one who has not this knowledge a most interesting and valuable chapter becomes like a museum without labels.

Besides this, the descriptions themselves are often vitiated by the author's ignorance of what he is writing about. Referring to a "loudly humming hawkmoth" which hovers over groups of canes, he says that it is probably the mature representative of a chrysalis which inhabits chambers built out of the pinnæ of the leaves rolled up, in which it makes a furious rattling when disturbed. The description, which is very well done, exactly fits the chrysalis of a gigantic Hesperiid butterfly, but is ludicrously inapplicable to any known hawkmoth. Again, recalling the old-fashioned bungalows of his 'griffinhood,' with their white-washed walls, he says that the larvæ of clothes-moths walked about everywhere in "little ambulatory coffins." The curious insect he means is well known, but it has nothing to do with clothes. It seems to feed on the minute lichens that grow on damp walls. These mistakes, of which we could multiply examples, are perhaps trivial in themselves, but they make it impossible to accept without reserve some of the interesting and original observations with which the book abounds. And it must be added that the style occasionally rises into a strain of semi-humorous vehemence which leaves the reader in doubt whether he is listening to fact or fable. Witness the following extract from a long rhapsody on the "autumnal concerts" of jubilant, or lovelorn, insects :—"Nothing short of actual auditory experience can serve to give any just idea of the horrors of the din ; no amount of use to the hubbub of frogs, cicadas and common crickets which fills the air of nights in moist, tropical regions, can lead to an indifferent tolerance for such a screeching, thrilling, ear-splitting, nerve-rending clamour. When in full force it is enough to upset the balance of the soundest nervous apparatus, and to people of irritable temperament it makes for madness." We have heard of an Irishman on the subordinate staff of an Indian Railway, who lay in wait, with his gun, for a monster bull-frog, because it had taken possession of a puddle in front of his house and kept shouting, "You're dronk, You're dronk," but to any Anglo-Indian blessed with the instincts of a naturalist we imagine that the chorus of joyous voices which greet rain after dust and heat rank among the pleasures, not the pains, of life in the tropics.

Perhaps it is not fair to criticise in this spirit a work which, as we have already said, makes no claim to be scientific. From another and no doubt the right point of view, as a random record of reminiscences, some bright, some dark, but all beautiful now in the sunset tints of the day that is past we find it wholly delightful. The author enjoys a most enviable sensitiveness to the influences of nature and a power of vivid description that has made his notebook a cinematograph by means of which he leads the days and nights of the forever bygone in procession before our eyes. Many a retired Anglo-Indian, reading the concluding chapters on the seasons, will live again a happy past, resting in his easy chair in the verandah, seeing in minute and clear detail the glowing tints on the leaves of the trees, the lichens on their trunks the sunbird, the crow, the striped squirrel and the black, advancing thunder cloud; or hearing the hum of the threatening mosquito, the bizz of the dazed dragon-fly against the wall, the thump of the hawkmoth against the ceiling and the bellowing of the bull-frogs in the rice-field; or perhaps feeling on his cheek the furnace blast of May, or else scenting that first, inspiriting breath of the morning which announces the approach of the cold season. For this resurrection many who are now monotonously drawing their pensions will feel grateful to Colonel Cunningham.

We must recur, however, to the character of the book as a contribution to science, for there is one chapter, with an Appendix, which challenges criticism from this point of view and is well worth it. The subject of this chapter is the "caprification" of *Ficus roxburghii*, a phenomenon which Colonel Cunningham has minutely investigated and on which he contributed a paper to the Annals of the Calcutta Botanical Gardens as long ago as 1889. It may be as well to explain here that caprification is the term applied to the fertilization of figs by a minute Hymenopterous insect of the family Chrysididæ (nearly allied to the "gall-flies") which is bred in one fruit and afterwards passes into another, carrying pollen with it. From time immemorial the fruit growers of Italy and Greece have observed the practice of hanging wild figs infested with this fly in their orchards, believing that otherwise the fig will not perfect its fruit. Some entomologists have regarded this as a mere superstition, but others have asserted that the belief was supported by facts, and a few years ago the American government went to the expense of sending out an agent to Turkey for the express purpose of procuring infested wild figs with a view to the improvement of those grown in California. The superior flavour of the Smyrna fig depends much on the essential oil contained in its numerous small seeds, and the California-grown fig, not being caprificated, develops no seed. We are not aware what success attended the American experiment, but it is now well known that several species of *Ficus* are dependent for perfect fructification on the aid of insects, the construction of the fruit, which is a closed receptacle with all the flowers opening on the inside, being such that pollen can by no means pass from one to another without such aid. The insects are equally dependent for the propagation of their species on the figs.

This interdependence appears to be carried to the furthest pitch in the large fruits of *Ficus roxburghii*, which Colonel Cunningham selected for investigation. In this species one tree bears fruits containing only normal female flowers, while another bears fruits which contain normal male flowers and also female flowers strangely modified, so that they can never produce seeds but furnish exactly the conditions required for receiving the eggs and nourishing the larvæ of the insect that lives in them. Colonel Cunningham calls these "gall-flowers," a misleading term, for galls are malformations produced by, not conditions of preparation for, the operations of insects. If not visited by insects both kinds of fruit develop only up to a certain point and then wither without producing either pollen or seeds; but if visited they commence to swell at once and come to full maturity in due course. The whole circuit of operations, as described by Colonel Cunningham, is briefly this. The female insect enters a male flower and deposits her eggs in the modified female flowers. The larvæ develop inside the ovarian receptacle and the males emerge first. It is not stated by the author whether the insect is Hymenopterous, Dipterous or Lepidopterous, but he says that there are three species, found in Calcutta, Sikkim and Cherat respectively. No doubt they all belong to the family of Hymenoptera mentioned above. The male has no wings, but very powerful jaws, by means of which it cuts a way through the dense plug of stiff, glutinous bracts that practically blocks up the orifice which is structurally present in all figs. Having thus opened a way to liberty for the winged but feeble females, they perish. The females follow, after wandering among the pollen-covered anthers of the male flowers, and so many as are not snapped up by the eager enemies that lie in wait for them at the gate fly away in quest of other fig trees bearing fruit, to which they may commit their eggs. And here is a wonder. Before attempting to enter any fruit they examine it carefully and ascertain unerringly whether it has arrived at a proper stage of development for their purpose, but they fail to distinguish between male and female fruits. Consequently many try to enter the latter. The plug of bracts in the female fruit is particularly dense and there are no gallant males now to open a way, so the majority stick and perish in the passage, but a few struggle through to find that they have made a mistake. They wander about, plunging their ovipositors vainly into the thick and resistent ovaries of the unmodified flowers and die without issue. "But though such attempts," says the author, "are entirely futile in so far as the end to which they are directed is concerned, they are of immense importance in the economy of the fruit which is attacked;" for the stimulus supplied by the deluded insects is followed by general hypertrophy and the development of fertile seeds. It will of course be assumed that this is the result of the pollen brought from the male fruits getting brushed off on the stigmata. Not so. Colonel Cunningham has satisfied himself that the obstructions through which the insect has to pass before it penetrates the female fruit leave no appreciable amount of pollen adhering to it, and further that the small number of insects that manage to get in could not possibly pollinate the number of flowers that are affected. In one case in which there was no evidence of more than one insect having got into a fruit, 11,000 mature seeds were counted in it. This part of the argument, the whole of it indeed, is rather diffuse and indirect, but the author plainly arrives at the conclusion that the general hypertrophy of the reproductive parts induced by the stimulus which the insects apply leads to the parthenogenetic production of seeds. Colonel Cunningham seems scarcely to realise the startling and revolutionary character of this proposition and he makes no attempt to face the problems into which it plunges us. If it is true, let us consider some of the corollaries.

Parthenogenesis has for a long time been known to be not unusual in certain Algæ and other cryptogams, and more recently its occurrence in Alchemilla and several other genera among the higher orders of plants has been ascertained. It has also been proved that the formation of an embryo can be stimulated in other ways than by pollination. But all such reproduction is vegetative merely and involves no union of two cells derived from different individuals. Wherever sex exists we must assume that such union is important, if not necessary, and as a matter of fact we find that, even where parthenogenesis, or other vegetative reproduction, is normal, provision is made for sexual reproduction also by alternation of generations or otherwise. The life history of the malaria parasite furnishes a good example of the same truth in the animal kingdom. More than this, it is manifestly very important, if not necessary, that the two sexual cells which unite should have been derived from different individuals. There is no end to the special and complicated contrivances to secure cross-fertilization, and even to prevent self-fertilization, which the vegetable kingdom presents. This end is most successfully attained when the plants are unisexual. Where this is not the case, it is sometimes secured by dichogamy, *i.e.*, by the male and female flowers maturing at different times. In *Ficus* we find a curious combination of both these conditions, for, while some trees bear only female fruits, the fruits of other trees of the same species contain flowers of both sexes, which do not mature simultaneously. In *Ficus* we have also a special insect provided, which by its structure and instincts is fitted to perform the operation of cross-fertilization for this particular fruit and no other. But now, in the case of *Ficus roxburghii*, the effect of the whole is found to be a retrogression to pure parthenogenesis, sexual reproduction being apparently impossible except as the result of a rare accident. And the male has ceased to serve any sexual purpose: it is reduced to a mere by-product of the female, maintained for the sake of providing a *nidus* for a useful insect. This is very nearly a *reductio ad absurdum* and we find it easier to believe that some important factor in the case has entirely escaped detection. We have said that Colonel Cunningham does not face the issues which he has raised. The reason appears to be that his interest has been entirely absorbed in speculation as to how such a marvellously intricate interdependence of tree and insect could have been evolved. This illustrates a recent phase of science which we cannot help regarding as supremely unscientific. The concern of true science should be to ascertain what is, not to guess how it must have come to be.

It should be mentioned that the book is illustrated liberally with beautiful photographs.

E. H. A.

CORRESPONDENCE.

PROPOSED ALTERATION TO THE FOREST RULES IN REFERENCE TO THE CLOSE TIME FOR QUAIL AND BUSTARD IN THE BOMBAY PRESIDENCY.

(Copy.)

6, Apollo Street,
Bombay, 23rd *March* 1908.

From

The Honorary Secretary,
Bombay Natural History Society,
Bombay ;

To

The Secretary to Government,
Revenue Department,
Bombay.

Sir,—The Committee of this Society observe that the Bombay Government propose to amend the present Forest Rules by extending the close season from the present date (September 30th to November 15th), such extension to apply to the following birds :—

The Black-breasted or Rain Quail (*Coturnix coromandelica*).
The Rock Bush-Quail (*Perdicula argunda*).
The Jungle Bush-Quail (*Perdicula asiatica*).
The Painted Bush-Quail (*Microperdix erythrorhynchus*).
The Bustard-Quail (*Turnix pugnax*).
The Little Button-Quail (*Turnix dussumieri*).
The Indian Button-Quail (*Turnix tanki*).
Common or Grey Quail (*Coturnix communis*).
The Great Indian Bustard (*Eupodotis edwardsi*).

My Committee welcome the proposed alteration of the dates, but they think that some mistake must have been made in including in this period the Common or Grey Quail (*Coturnix communis*) and the Black-breasted or Rain Quail (*Coturnix coromandelica*).

To bring these two birds under the same regulations as the other Quail is to afford adequate protection to neither during their true breeding seasons and to protect both at a time when they least require it.

The Common or Grey Quail, a migratory bird, breeds in suitable climates all over the Northern hemisphere at the same time of the year, that is to say from March to June, according to temperature and localities. It is true incubated eggs have been found at Allahabad as early as the 25th March, and it has also been found breeding in Purneah and Lahore in April, and Gilgit in May. Of the enormous numbers of Grey Quail that visit India each cold weather, so few remain to breed however that it is doubtful whether any practical good can be derived from a close season. But to have any effect at all, the close season should begin not later than the beginning of April and no protection at all is needed for the Grey Quail after, say, the 12th August. Soon after that date migrants begin to appear along the Indus Valley and almost the whole of these have travelled long distances from breeding places far across the frontier. The natural close season for Grey Quail (if necessary at all in most parts of India) is therefore *from April 1st to August 12th.*

The Rain Quail, on the other hand, which is a species practically confined to the Indian Empire, breeds everywhere at the end of the rains from August to November. Writing from Sholapur where it breeds abundantly, Mr. Wenden says: "On the 28th July this year I received my first warning that it was time to discontinue shooting these birds." Their nests have been found on the Deccan throughout August and September, and fresh eggs in the first week of October. That young birds hatched in October should be fit to shoot by the 15th November—is clearly impossible, and as a matter of fact in the Konkan, 'cheepers' hardly able to fly, can be seen as late as the middle of December. On the other hand, Jerdon is quoted as stating that they breed in June or July and Hodgson says that they breed in Nepal in May and June, but the generally accepted view is in favour of a close season on the plains *from 15th July to 30th November.*

The Bombay Natural History Society therefore beg to suggest to Government the advisability of altering the dates suggested for the close season for these two birds to—

Grey Quail ... ... April 1st to August 12th.
Rain Quail ... ... July 15th to November 30th.

My Committee also hope that Government will be able to see their way to amend the Rules framed under the Wild Birds Protection Act by Municipal and Cantonment authorities in this Presidency, so as to bring these rules into line with the proposed amended clauses of the Indian Forest Act.

I have the honour to be,
Sir,
Your most obedient Servant,
(Sd.) W. S. Millard,
Honorary Secretary,
Bombay Natural History Society.

PROPOSED INVESTIGATION AND PROTECTION OF THE FISHERIES OF WESTERN INDIA.

The following correspondence between the Society and the Bombay Government on the above subject is published for the information of members. Since then more information has come to hand showing that the Madras Government have established a Fishery Bureau, presided over by Sir Frederick Nicholson, K.C.I.E., I.C.S., and the Bengal Government have issued a lengthy report on the Results of Enquiry into the Fisheries of Bengal, compiled by Mr. K. G. Gupta, I.C.S., and have obtained from Europe a Steam-trawler for experimental fishing in the Bay of Bengal.

It is hoped, therefore, that both for economic and scientific reasons the Bombay Government will be able to see their way to carry out the suggested investigation and protection of such an important industry to the people of Western India.

(*Copy.*)

6, Apollo Street,
Bombay, 11*th March* 1907.

From

The Honorary Secretary,
Bombay Natural History Society,
Bombay;

To

The Secretary to Government,
General Department,
Bombay.

Sir,—I am directed by my Committee to forward to the Bombay Government the accompanying copies of two papers on "Estuary Fishing in Western India" and on "Protective Legislation for Indian Fisheries" which have just appeared in this Society's Journal, with the hope that Government may be able to see their way to introduce some legislation for the protection of the Fishing Industry in Western India. My Committee instructed me to say that they considered that the subject is of urgent importance as from the evidence given they believe that without some legislation, the creek and river fishing industry on this side of India is threatened with extinction. I am to add that although the precise scope of the enquiries are not known to them, my Committee observe with pleasure that the Madras Government have recently decided to investigate the general subject of fisheries in that Presidency.

My Committee instruct me to finally say that as the beneficial results of any effective legislation, if introduced, would be apparent in most creeks and rivers in a very few years, it seems probable that the fishing classes would speedily learn to fully appreciate any such measure.

I have the honour to be,
Sir,
Your most obedient Servant,
(Sd.) W. S. Millard,
Honorary Secretary,
Bombay Natural History Society.

6, APOLLO STREET,
BOMBAY, *16th January* 1908.

From

THE HONORARY SECRETARY,
Bombay Natural History Society,
Bombay;

To

THE SECRETARY TO GOVERNMENT,
General Department,
Bombay.

SIR,—I am directed by my Committee to draw the favour of your attention to their communication dated the 11th March last, wherein prominence was given to the need for the introduction of some form of protective legislation to prevent the present apparently wholesale destruction of the fry and fresh water fish in this Presidency.

In doing so, my Committee instructed me to forward for the information of Government two papers entitled "Estuary Fishing in Western India" and "Protective Legislation for Indian Fisheries" which appeared in the Society's Journal in February last.

My Committee presume that the subject is obtaining the consideration of Government, but as they have heard nothing since the 26th of March last, when the receipt of this communication was acknowledged, they venture to once more urge upon Government that the beneficial results of any effective legislation "would be apparent in most creeks and rivers in a very few years," and that the need for some action in this matter is being recognised in other parts of India, notably Madras, where it is observed that an official has actually been appointed as Pisciculturist to Government.

My Committee direct me to ask Government to favourably consider the expediency of creating a Fisheries Department, one of the immediate functions of which would be the enforcing of an Act which might be so framed as to mitigate the inconvenience which the average native fisherman will undoubtedly at first feel; but the provision of which would, in a short time, lead to a very appreciable augmentation in his supplies.

If further enquiries are deemed to be necessary to justify the introduction of a mild form of legislation, my Committee desire me to submit for consideration the expediency of appointing a Commission or an Official to continue the investigations already started.

I have the honour to be,
Sir,
Your most obedient Servant,
(Sd.) W. S. MILLARD,
Honorary Secretary,
Bombay Natural History Society.

No. 1859 of 1908

REVENUE DEPARTMENT,
BOMBAY CASTLE, 21*st February* 1908.

From

J. E. C. JUKES, ESQ., I.C.S.,
Acting Under-Secretary to the Government of Bombay.

To

THE HONORARY SECRETARY,
Bombay Natural History Society.

SIR,—I am directed to acknowledge the receipt of your letter, dated 16th January 1908, on the subject of the protection of fisheries in the Bombay Presidency, and to state that the Governor in Council has taken the matter into consideration. The Governments of Madras and Bengal have instituted inquiries into the question of fisheries so far as those Presidencies are concerned, and this Government is in correspondence with those Governments on the subject of their investigations.

I have the honour to be,
Sir,
Your most obedient Servant,
(Sd.) J. E. C. JUKES,
Acting Under-Secretary to Government.

MISCELLANEOUS NOTES.

No. I.—A WONDERFUL LEOPARD SKIN.

In our report of the meeting of the Zoological Society reference is made to a remarkable leopard skin from the Deccan recently presented to the British Museum. As regards its markings, this skin presents, perhaps, the most extraordinary variation from the normal type that has ever been noticed in the case of large animals. So remarkable, indeed, is the variation that if the locality whence it was obtained were not thoroughly well authenticated the skin would be unhesitatingly regarded as indicating a new and, at the same time superbly handsome, species or race. Although the black markings present some approximation in pattern and mode of arrangement to the jaguar type, the head and back are ornamented by an altogether peculiar kind of big-meshed network of broad buff lines, the first mesh, which occupies the head, being much larger than all the others. The district whence the specimen came abounds in leopards, which, according to the donor (who has special opportunities of observing, since all the skins by claimants for the Government bounty have to be submitted to him), are all of the normal type. Tigers, on the other hand, are rare. And this naturally gives rise to the suggestion that the abnormal skin may be that of a tiger-leopard hybrid. Against such a plausible theory is the solid fact that the markings present no approximation to the tiger type. To imagine that an unknown species of big cat inhabits the Deccan would be to violate all the probabilities. Hence we are driven to regard the specimen in the light of a special individual variation or (shall we say?) mutation. But the variation from the normal is so great that if it has arisen suddenly and spontaneously there can no longer be any question as to the possibility of the production, *per saltum*, of a well marked racial, if not specific, type; although, of course, the variation would soon be eliminated, unless a mate of the same type was also available. In bringing the specimen to the notice of the society the describer confessed himself quite unable to offer any suggestion as to the origin of such a remarkable variation.—(*From* " *The Field*," *18th January* 1908.)

No. II.—A PANTHER AND A BUFFALO.

The following incident which occurred a few days ago, seems to me so extraordinary that it deserves to be recorded :—

I was sitting up over the carcase of a bullock which had been killed by a panther about 100 yards from a village. Just as it had got quite dark, I saw three or four village buffaloes approach the kill, and begin grazing some twenty yards away. As I was watching the buffaloes, I suddenly made out the form of the panther as it came up to the kill. Simultaneously one of the buffaloes noticed it, and snorting loudly advanced towards it. The panther immediately decamped, and the buffalo went on grazing. In a minute or two the panther returned and lay down beside the dead bullock, in which position I could no longer make it out. Presently the buffalo grazed up to within five paces of the kill, as it took no notice of the panther, I concluded that the brute had sneaked off unobserved by me. At this moment however I heard a crunch, as the panther started to feed. The buffalo looked up, and advanced a pace towards the kill. The panther continued its meal, and the buffalo, after a prolonged stare, went on grazing, paying no more attention to the panther than if it was a pariah dog. It was actually grazing within five yards of the panther, and broadside on to it. For the next twenty minutes or so, the buffalo remained within fifty yards of the kill, grazing unconcernedly. The other buffaloes seemed to take no interest in the proceedings, though I could hear them moving about in the vicinity. The buffalo's behaviour seems to me inexplicable, being within five yards of the panther, I should have expected it to show some signs of excitement, and either charge or decamp. The absolute indifference which it exhibited towards the panther was most extraordinary. I should like to know if any of the members of the Bombay Natural History Society have ever observed anything similar to this incident? I may add that I did not bag the panther. What little moon there was, was clouded over, and as the panther continued feeding for twenty minutes or so, I could not make out anything to fire at. Finally as I was leaning over the edge of the machan in my endeavour to spot it, the panther took alarm and made off.

H. TYLER, I.C.S.

CAMP KALAHANDI, 10*th April* 1908.

No. III.—THE INDIAN MONGOOSE.

A casual acquaintance with several of the mongooses leads me to believe that a great deal remains to be learnt regarding the less common species. The Indian *Herpestes mungo* is a favourite pet in the East, and so its intelligent and amusing habits have become well known. Several other species, however, exist, differing from it conspicuously in both colour and size.

I have been especially puzzled over a mongoose which I saw on several occasions in the neighbourhood of Jagner, thirty-four miles from Agra, in the United Provinces. This animal was rather larger in size than *H mungo* but appeared to be of much the same colour. The noticeable feature about it, however, was the tail, which was somewhat full, with a very marked white tip. At the time it did not strike me that there would be any difficulty in identifying the animal, and it was only after I had left the district and the opportunity for obtaining a specimen had gone that I found to my surprise that natural history works mentioned no white-tailed Indian mongoose, though there seem to be two in Africa, *H. albicauda* and *Cynictis penicillata*, both of which have white tips to their tails.

A large red mongoose, apparently *Herpestes smithi*, is common all over the Neilgherry plateau and in Wynaad. I have seen and shot specimens from near Ootacamund, over 7,000 ft. above sea level, down to South-East Wynaad, which has an elevation of about 3,000 ft. These ruddy mongooses are big, powerful animals, and extremely destructive to game, so much so that the Neilgherry Game Preservation Society used to give a reward of Rs. 2 for every skin presented at the Cutcherry. I have often seen them prowling about in couples both near Ootacamund and also in Wynaad. In the latter district are numerous swamps and rice fields set amid low wooded hills. In the early mornings I used often to see red mongooses in these swamps, where they doubtless were hunting for snakes and frogs.

These large mongooses have extraordinary tough skins, while their hair is very wiry, consequently they are almost proof against dog bite. One I had wounded near Wellington was worried by three big dogs I had with me, yet when I removed the skin I found that it had been nowhere perforated by the numerous bites. These same dogs would eat almost any kind of meat; so one day I tried them with red mongoose stewed. None of them, hungry as they were, would touch it. The animal has a somewhat foxy odour, differing in this respect entirely from the smaller grey species, which have no smell.

In the United Provinces I used often to see very small mongooses with closer, shorter fur than *H. mungo.* These were no doubt *H. auropunctatus* I particularly remember watching two of these little fellows hunting along the edge of some aloe bushes close to the P.W.D. Bungalow at Khara Nuddee, eleven miles from Agra. I sat looking at them for a long time, and noticed that in all their ways they were very similar to the common mongoose.

Favourite haunts of the mongoose are the maze-like interiors of white ants' nests. Even long after the outside hillocks have crumbled away and fallen, a network of underground passages remains, where not only mongooses but jungle cats and other small mammals find safe retreat. I have seen mongooses both in Ceylon and Burma which to the ordinary observer's eye looked similar in size and colouring to the common Indian species. I always disliked shooting them, and this prevented the collection of any exact notes regarding local species or varieties.

Mongooses unfortunately kill for the sake of killing, so that their destructiveness is by no means limited by their appetite. I have known of one getting into a quail pit and killing an enormous number of the little birds.

When in Agra I had a large cage of canaries. A mongoose came into the house at ten in the morning and killed one of them. My Irish terrier was not far off, and retribution quickly followed. The same dog killed another mongoose in the Fort at Delhi; this one, too, boldly entered the house in broad daylight.

Tame mongooses will chase and kill rats just like terriers. They attack large long-legged birds like fowls by first seizing the foot and then rapidly climbing up and biting the throat. I have several times seen bandicoots turned into an empty room with mongooses, and the latter always declined the encounter. The big rat-like bandicoots of Madras sometime reach 3 lb. in weight; they put up their long hackles when cornered and grunt; even dogs are occasionally shy of tackling them.

The tough skin and wiry hair which I have alluded to in the case of the red mongoose are in a minor degree characteristic of the smaller species also, and no doubt often save them in their encounters with poisonous snakes. I have seen a 4ft. cobra strike a mongoose in the side and draw blood with its fangs. The mongoose suffered no ill effects, but very possibly the cobra may have previously exhausted its poison gland.

Mother mongooses take their young ones out and teach them to hunt. I have several times had opportunities of watching these family parties near Madras, where mongooses are plentiful. I do not know whether any attempt has been made to breed mongooses in England; the imported ones appear to stand the climate fairly well. I have once seen the common mongoose at Wellington (near Coonoor), but never as high as Ootacamund. A small mongoose is found in Kashmir 5000 ft. above the sea. This is probably *H. auropunctatus*, to which reference has been already made.

FLEUR-DE-LYS.

(*From "The Field,"* 22*nd February* 1908.)

[The above note and the following one are inserted because of the lack of information on the habits of these common animals. Our Society requires specimens of the skins of all Mongooses and Hares.—EDS.]

No. IV.—INDIAN HARES.

In most parts of India, where country and climate are suitable, hares are numerous. Districts with a moderate rainfall, and where large tracts of bush jungle alternate with cultivated plains, afford ideal conditions for them; consequently in the United Provinces and other parts of Upper India, where such conditions are to be found, hares are extremely plentiful.

Sportsmen who are quick and proficient with the shot gun can, of course, see no particular fascination in shooting an animal which, when put up, usually goes away at a slow canter and offers the easiest of marks; but it must be remembered that the majority of non-commissioned officers and men of our Indian garrison who devote their leisure time to sport are slow, uncertain shots, and can only afford to expend a limited number of cartridges. Hares, therefore, are much sought after and prized, and as the means of taking so many of our rank and file out of stuffy barracks and steaming bazaars into the free width of the open country these animals deserve a high place in the list of Indian small game.

The commonest Indian hare is *Lepus ruficaudatus*, and this species is spread throughout the peninsula from Madras to the Himalayas. It is also found at considerable elevations among the Kumaon Hills, and I have both seen and shot hares of this kind in the vincinity of Bhim Tal, nearly 5000 ft. above the sea. The average weight of *ruficaudatus* is 5lbs. and even in the hills, where feeding is abundant throughout the year, that weight is never much exceeded.

In the case of *Lepus nigricollis*, a local race found in the highlands of Southern India and Ceylon, the generous diet of the hills has improved the size, and I found that hares on the Neilgherry plateau averaged quite 1lb. heavier than those obtained from the low lands of Ceylon. One large specimen which I shot near Wellington, ten miles from Ootacamund, scaled no less than 8lbs.

This black-naped hare (*L. nigricollis*) is readily distinguishable from the common Indian hare (*ruficaudatus*) by the large dark brown or black patch at the back of the head, which extends from the ears to the shoulders. The upper side of the tail also is blackish near the tip, and its length is noticeably less than the tail of *ruficaudatus*, which, moreover, lacks the dark tip. The ears of the latter species have an outside border of black near the points. Black-naped hares are numerous all over the Neilgherry plateau, and have taken very kindly to the excellent covert afforded by the introduced Australian wattle. They find shelter also in the thick bush round the edges of the numerous sholas, while the excellent grass, which everywhere clothes the open downs, affords the best of feeding.

The common Indian hare (*L. ruficaudatus*) displays a somewhat suspicious predilection for the neighbourhood of villages, and when a couple are required for soup or jugging it is as well to have them shot at a distance from native dwellings. They are never worth roasting, but the fine Neilgherry hares are far superior for table purposes and quite equal, in fact, to the best English ones. Although the Indian hare affords tame sport for the shot gun, it becomes a worthier object of shikar if secured with a rifle. When put up it nearly always canters leisurely away for some fifty yards and then halts for an instant to look back. This gives the opportunity for a quick shot and as the customary halt and backward glance are seldom made until the hare is sixty or eighty yards off, the range is long enough to afford a fair test of skill.

In the United Provinces the short, sweet grass of well-watered compounds proves an irresistible attraction to hares during the hot weather. In Agra, when driving home after dusk, the lamps of my trap would often give me a fleeting glimpse of some hungry hare that had come far for the sake of the lawn, which I used to keep green with the help of a neighbouring well.

Indian hares have innumerable enemies—pariah dogs, jackals, mongooses and wild cats, as well as the larger birds of prey. As, however, they lie still during the day, and the hot sun quickly dries up all scent, they are then comparatively safe, unless one of their foes happens to stumble right upon them. At night and in the early morning and evening hares are on the move with all their keen senses on the alert; so if hunted they can generally obtain a good start, and their speed then gives them a fair chance of escape. On the Neilgherries I once saw three jackals running a hare in broad daylight; unfortunately, I did not succeed in seeing how the chase ended.

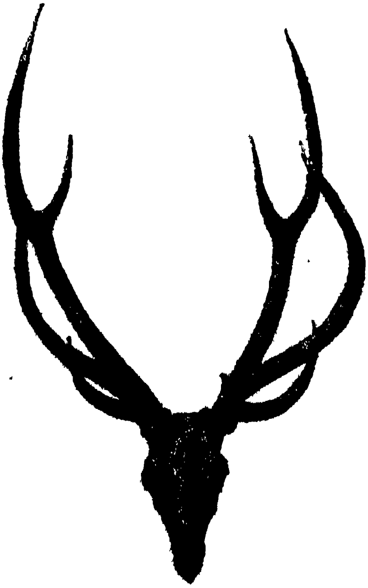
It is interesting to watch a hare settling herself for the day. Once in the Governor's park, Madras, while observing the antics of a family of mongooses, I heard a rustle close at hand, so stood perfectly still. A hare stole up to within 5 ft. of me, and proceeded to make herself comfortable in a patch of grass. She deliberately scraped the blades this way and that, until she had scooped out a hollow, and when the "form" was thus arranged to her satisfaction she settled herself down in it.

During the long hot weather, when the crops have all gone and most of the natural covert is burnt away by the sun, hares betake themselves in large numbers to sheltered bushy ravines. I saw a good instance of this once at Karaoli, a small village between Agra and Fatehpore Sikri, where, exploring some disused quarries overgrown with thorn bushes, I found them simply swarming with hares. *Lepus ruficaudatus* often lies out on open ploughed land just like the European hare. Somtiemes I have seen one go to earth in an anthill or fox burrow.

After the rains covert becomes everywhere abundant, and the hares then scatter all over the country. When beating crops for quail one constantly puts them up, and the broad belts of tamarisk along the banks of rivers are also favoured haunts. I believe that the range of the Sind or desert hare (*Lepus dayanus*) extends up to Rawal Pindi and Attock, for specimens which I shot in those localities appeared to be of a more ashy colour, and to have softer fur than *ruficaudatus*. The sandy and arid plains between Attock and Campbellpore are very similar to parts of Sind, so that it would seem natural enough that the fauna of the latter province should extend to the northern Punjab. Moreover, I have obtained near Attock the desert form of the Indian fox (*Vulpes leucopus*). I saw no hares in Kashmir, where they are either very scarce or do not exist in the valley. There seemed, however, to be plenty of ground well suited to them, especially the scrub covered hills on either side of the Jhelum, so often explored by partridge shooters.

FLEUR-DE-LYS

(*From " The Field,"* 7*th December* 1907.)



No. V.—ABNORMAL ANTLERS OF SPOTTED DEER OR CHITAL (*CERVUS AXIS.*)

The accompanying photograph is that of the skull and horns of a Chital stag shot by me in March this year in the Siwaliks near Hardwar.

The abnormal tyne on the left antler is 6 inches and that on the right antler 12 inches long, the length of the longest horn (the right) is 32½ inches. The stag was otherwise normal.

S. H. POWELL, MAJOR, R. E.,
1st P. W. O. Sappers and Miners.

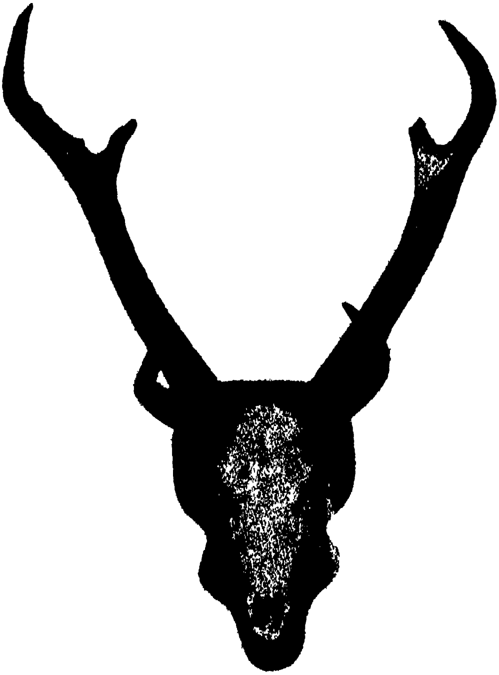
ROORKEE, 3*rd April* 1908.

No. VI.—A LARGE SAMBHAR HEAD. (MALAY VARIETY).

With reference to Mr. Hauxwell's note in the Society's Journal, page 188 of this volume, there is a Sambhar head (Malayan type) in the Mess, which measures as follows:—

	Right.		Left.
Round burr	12½		11¾
Just above burr	11¾		10½
Length outside curve	34		33½
Span between top points		24¾	
Greatest span		31½	
Length brow tines	14		13½

Our game record book records that it was shot "by Havildar Kalu Gurung" of this Regiment at "No. III Post N. Chin Hills in 1893."



The above photo will show that, although the excessive thickness at the junction of the branches of beams (*vide* Mr. Hauxwell's specimen) is not a feature of the trophy I describe, yet its length combined with its great girth would seem to make it a record head for the Malayan type and we shall be glad to know if this is so.

CHAS. R. PEARCE, MAJOR, I.M.S.,
10th Gurkhas.

MAYMYO, U. BURMA, 14*th March* 1908.

[According to Burke's "Indian Field Shikar Book" (3rd Edition), the record length for the Malay variety of the Sambhur is 33½ inches, so that the head above referred to is a record.—EDS.]

No. VII.—A SIAMESE HOG-DEER.

In all works on the game animals of India (including my own) it is stated that the para or hog-deer (*Cervus porcinus*) does not extend further east than Tenasserim. A hog-deer from Siam is, however, figured in plate 69 of Dr. L. Heck's *Lebeude Bilder aus dem Reiche der Tiere*, published in 1899. This Siamese hog-deer is rather larger than the Indian animal, from which it also differs by the absence of spots in the summer dress, a feature common, perhaps, to all the representatives of the species from the countries to the eastward of the Bay of Bengal. For this eastern race, as typified by the Siamese specimen above referred to which was living about 1899 in the Berlin Zoological Gardens, the name *Cervus porcinus hecki* would be appropriate. Dr. Heck mentions that Dr. Sclater proposed the name *Cervus minor* for the spotted Indian hog-deer; but even if that be so the name is preoccupied.

R. LYDEKKER.

(*From " The Field," April 4th*, 1908).

No. VIII.—A NEW GAZELLE FROM PERSIA.

Among the collection of trophies sent home by Major R. L. Kennion from the Bujnurd district of north-east Persia is the head of a gazelle, which proves to be quite distinct from the goitred or Persian gazelle (*Gazella subgutturosa*), as well as from *G. dorcas* and *arabica*. From the goitred species it is distinguished by the fawn-coloured face, with the usual gazelline markings, the long ears, and the simply divergent horns, which are quite distinct from the doubly-curved, sublyrate type characteristic of the ordinary Persian species. It is also markedly different from the dorcas and Arabian gazelles. It comes, in fact, much nearer to the Algerian Edmi gazelle (*G. cuvieri*) in general character, although differing somewhat in the shape of the horns. This suggests affinity to a species from Palestine, described by Mr. O. Thomas in the Zoological Society's *Proceedings* for 1904 (vol. ii., p. 348) under the name of *G. merrilli*, which is stated to be the Asiatic representative of the Edmi, but showing certain differences in horn characters. How close is the relationship I have not yet been able to determine but since Bujnurd is a long way from Jerusalem there is a probability that a racial difference between the two gazelles will be found to exist. If this should prove to be the case I would name the Bujnurd race after Major Kennion. In any event the discovery is of considerable interest. Compared with the type skull of *G. merrilli*, which is that of a fully adult animal, the horns of Major Kennion's gazelle are much longer (11¼in. against 9½in.), carry more rings (sixteen against eleven), display a less distinctly S shaped curvature when viewed in profile and curve much more decidedly inwards at the tips, so as to give a slightly sublyrate form in front view. This sublyrate form and distinct inward inclination of the tips, as well as the relative shortness of the smooth points of the tips themselves distinguish the horns from those of the north African *G. rufifrons*, while they are equally different from those of *G. cuvieri*. I have, in fact, little doubt that the Bujnurd gazelle is a distinct species.

R. LYDEKKER.

(*From " The Field," 11th January* 1908).

No. IX.—MAJOR KENNION'S GAZELLE.

In reference to the gazelle referred to in the *Field*, Jan. 11th last, p. 71, I have just received a letter from Major Kennion in which he states his willingness to present the specimen to the British Museum, and also that the animal was killed not at Bujnurd, but at Kain on the Afghan Frontier of Persia. It is also mentioned in the letter that the local shikaris recognise two kinds of gazelle in that district, one being, of course, the ordinary Persian goitred gazelle, and the other the one under consideration. The British Museum possesses another head of the same gazelle presented by Mr. T. W. Greenfield in 1899, and shot by him on the Helmund river in Baluchistan. It has hitherto been referred to *Gazella subgutturosa* as has also the Yarkand gazelle, under the racial name of *G. s. yarcandensis*. I am, however, now of opinion that the saikik or Yarkand gazelle (as was long ago suggested by its describer, Dr. Blanford) is entitled to rank as a distinct species under the name *Gazella yarcandensis*. It is distinguished from the goitred gazelle (*G. subgutturosa*) by its superior size which is about equal to that of the North African edmi (*G. cuvieri*), larger ears, distinct dark face markings, which are not interrupted by a white band below the horns and a darker brown nose spot. The horns are stouter and more distinctly sublyrate without the double backward curve of the goitred species. From the edmi the saikik is distinguished by the more lyrate horns of the bucks and the absence of horns in the does.

So far as I can determine in the absence of skins of the latter (which are preserved in Calcutta), Major Kennion's gazelle seems to be a local race of the saikik for which the name *Gazella yarkandensis kennioni* may be suggested. It appears to be distinguished by the paler face markings, which are sandy rufous, with a dark brown nose spot in Major Kennion's specimen, and the more closely ridged horns, of which the tips in mature bucks are less turned inwards. The number of ridges on the horns is from sixteen or seventeen to nineteen or twenty, whereas fourteen to sixteen is more usual in the Yarkand race, of which, however, the British Museum does not possess any very old examples. The Baluchi head presented by Mr. Greenfield is that of a very old buck, in which the rufous has faded to grey, with a consequent accentuation of the nose spot, and another spot in advance of each eye on the lateral face stripe. The tip of the nose and muzzle has also become white. On the assumption that I am right in referring this Eastern Persian and Afghan gazelle to the same species as the Yarkand animal, it will be convenient to employ the name of saikik gazelle for the species, and to designate its two races respectively as the Yarkand and the Afghan saikik.

R. LYDEKKER.

(*From* " *The Field*," 21*st March* 1908.)

No. X.—HABITAT OF THE CHINESE PANGOLIN (*MANIS AURITA*).

I notice that Blanford in discussing the habitat of the Malay pangolin *Manis javanica*) in his *Fauna of British India, Mammalia*, 1891, p. 607, says

"I have not been able to ascertain whether this species or *M. aurita* inhabits the hills South of Assam." It is not very clear what hills he refers to since he includes within the area of the distribution of *Manis javanica*, Sylhet, which is the most Southern part of Assam, and Tipperah which is immediately further South. Again he gives Assam as within the range of *Manis aurita*. It appears to me he was in doubt which species inhabited the Assam Hills South of the Brahmaputra, and if I am correct in thinking so, it will be of interest to know that I have just seen, and examined a very fine skin of the Chinese pangolin *M. aurita* from the base of the Naga Hills.

The specimen is typical. The rows of scales at midbody are 17, the last four rows are strongly keeled and the next obtusely but very distinctly keeled. There are 17 median vertebral caudal scales. The median fore claw is twice the length of the corresponding hind claw.

Mr. B. R. Prichard, who owns the skin, tells me the animal was dug out of a white ant's nest between Moriani and Titabar at the base of the Naga Hills The Assamese call it "keotai pohoo" and his Indian coolies "Suruj mookee."

The skin is 23¼ inches from the snout to the end of the body and the tail 13½ inches.

F. WALL, C. M. Z. S.,
MAJOR, I.M.S.

DIBRUGARH,
ASSAM, 13*th February* 1908.

No. XI.—NOTE ON THE MALABAR SPINY MOUSE (*PLATACANTHOMYS LASIURUS*).

I see that in the *Fauna of British India* (*Mammalia*), page 394, Blanford doubts the correctness of "locality" in a specimen labelled Ootacamund. I had the good fortune to have brought to me by my son recently a pair of these mice from near my house—elevation 6,100 feet. As this is very little below Ootacamund, it is therefore possible the British Museum specimen is correctly labelled. The pair I have are male and female and were found in a nest in a hole in a tree—the male was unfortunately killed, but the female I have in a cage and she had two young the night of the day she was caught and two more the following night and all are in good health. The mother is very tame, and not at all fierce and I should imagine this mouse is of a very gentle disposition. I may mention a strange fact about the young of this mouse—each pair keeps in a different corner of the cage—the four are not together.

CHAS. GRAY.

ORCHARD DENE, COONOOR, 29*th April* 1908.

[Our Society received a flat skin of this interesting mouse some few years ago from Mr. H. Wapshare, who at the time wrote that he obtained it in South-East Wynaad, 30 miles west of Ootacamund, at an elevation of 3,800 feet. The skin, though a bad specimen, is still in our Museum.—EDITORS.]

No. XII.—NOTE ON THE HABITS OF THE BENGAL RED-WHISKERED BULBUL (*OTOCOMPSA EMERIA*).

The efforts of the lapwing plover to distract mankind from its nest are proverbial, and many people labour under the impression that this trait is peculiar to that particular bird. This is not the case, and I witnessed such a very pretty example of maternal solicitude in *Otocompsa emeria* recently that I think it perhaps worthy of note in our Journal. A pair of these birds had three well-grown nestlings in a nest concealed in creepers overhanging my porch. Several times I visited the youngsters and examined the changes in their plumage, without the parents exhibiting any alarm at all, but on the 23rd instant, when Lieutenant Martin, of the 94th Russell's Infantry, came to have a look at them, we found the youngsters out of the nest and sitting on the twigs close to it. Our arrival at once brought the parent birds, who were much excited. They seemed to lose all fear in their anxiety for their offspring, approaching quite close to us, and scolding us vigorously, every now and then putting in a melodious chirp to encourage the little ones. After a few seconds of this one of the birds, presumably the female, threw herself down on to the roadway close to us, and with wings distended began to squirm about on the ground giving an exact imitation of a badly wounded bird who has had both its legs broken. The simulation was perfect, and it is interesting to speculate how the bird acquired its knowledge of how a badly wounded bird would behave! The whole occurrence seems to me to point to reason rather than instinct—though I am aware I tread upon delicate ground in saying so!

ARUNDEL BEGBIE, MAJOR,
8th Rajputs.

LUCKNOW, *28th March* 1908.

[In Vol. XIV, page 162 of our Journal, Mr. E. H. Aitken records the same incident in connection with the Southern Red-whiskered Bulbul (*Otocompsa fuscicaudata*) and our Honorary Secretary a few weeks ago witnessed similar behaviour on the part of the Madras Red-vented Bulbul (*Molpastes hæmorrhous*) in his fernery at Malabar Hill, Bombay —EDS.]

No. XIII.—NOTE ON THE HOUSE-SPARROW AND GEESE.

Yarrell closes his chapter on *Passer domesticus* with a vignette of one of the family suspended by the neck at the door of his dwelling in the frieze of the Rotunda in Dublin. Twice in one week in a garden at Lahore I found sparrows which had met a similar death, not at the doors of their houses, but in bushes. One was caught and hung in a bit of string in the bush, the other had, in endeavouring, probably after some mischief, to scuttle through a bush, caught his neck in a fork of two small branches. Hume in his "Nests and Eggs of Indian Birds" expresses a wish that all the race would so perish. Some of your readers may be glad to hear that two more, besides the one that Yarrell has immortalised, have met such an end.

All books tell us that the sparrow does occasionally have pity on us and build his nest in a bush. Never till this year did I come across such a nes

The builders had evidently had little practice in open air building and the nest was a clumsy one, and had a dome over it. Wishing to encourage the race to leave my bungalow alone and revert to trees, I spared the nest, but some native boys, seeing my interest in it, as soon as my back was turned, pulled it to pieces. The only well finished part of it, as well as I could see, was the entrance passage.

The same birds have now a nest in another tree close by and about it is this point of interest, *viz.*, that the nest was commenced by a pair of Munias and I am not sure but that the Munias have not even now a share in it. I cannot observe too closely for fear of this nest being destroyed as the other one was.

The following too about other birds may interest our readers. A friend of mine had a pair of geese. The female bird after laying died. The eggs were placed under a fowl and duly hatched out. Then the poor hen tried to feed them, clucking diligently and scratching the ground for them, but with no success. The widower, however, heard the goslings before he saw them and coming up he sent their foster-mother to the right-about in no time and took charge himself, feeding them carefully and nestling them under his wings. He has continued his care and allows no one else to touch them.

T. BOMFORD, REVD.

DERA ISMAEL KHAN, *April* 1908.

No. XIV.—THE OOLOGY OF INDIAN PARASITIC CUCKOOS.

In Vol. XVII, page 892, Mr. Stuart Baker mentions some eggs sent to him by Mr. Primrose and myself. I gave him a long account of the finding of the nests, and our reasons for supposing them to be cuckoo's eggs and to belong to the Violet Cuckoo (*Chrysococcyx xanthorhynchus*), and not to the Rufous-bellied Cuckoo (*Cacomantis merulinus*). Mr. Primrose and myself have taken some seven or eight nests of the Himalayan Yellow-backed Sunbird (*Æthopyga seheriæ*) containing what we consider cuckoo's eggs. Our reasons for considering them cuckoo's eggs and attributing them to the Violet Cuckoo are as follows:—

At least some twenty nests of this sun-bird were taken which contained eggs and only seven or eight had any eggs in them which differed from the type of the undoubted sun-bird's eggs, and in every case there was only a single egg in each nest which differed from the others. In every case the single egg was larger and quite differently marked from the others in the nest. Had they not been cuckoo's eggs one would have expected to find a clutch of eggs of that type, but in no instance was this the case, so I think we may safely consider these eggs parasitic and belonging to a cuckoo.

Now let us consider by elimination the species of cuckoo to which these eggs belong. The only small cuckoos we noticed or shot in the Gooma Reserve were the Violet Cuckoo and the Drongo Cuckoo (*Surniculus lugubris*). Mr. Primrose also informs me that though he and his collector were always on the look-out for good cuckoos they never came across any *Cacomantis*; in fact the only small cuckoos they ever got were those mentioned by me. The Violet and Drongo

Cuckoos are plentiful during the breeding season only, or perhaps they are only observed then, as that is the season during which they are most vociferous. Had there been any others at all plentiful they would doubtless have been obtained; and when some eight nests are found of the same species in the same locality, it is very unlikely that they should belong to any very rare bird which Mr. Primrose has never seen. Of course *Cacomantis merulinus* may occur, but we doubt it; and if it should occur it is certainly very rare. We discard the Drongo Cuckoo because at that time we shot a bird of this species which contained a fully developed but unshelled egg. This egg was very much larger than any of the eggs found in any of the sun-bird's nests. The Drongo Cuckoo is also most likely to lay in the nests of the *Dicruridæ* and though this argument does not hold much weight, it is supported by such oologists as Messrs. Davidson, Bell and Col. Rattray. Nor did we shoot any Drongo Cuckoos in the vicinity of any of these nests; on the other hand we did procure a specimen of the Violet one, and heard others calling. Taking everything into consideration we can but come to the conclusion that our eggs can belong to nothing but the Violet Cuckoo.

The Indian Koel (*Eudynamis honorata*).—On the 7th July 1906 I personally superintended the taking of a Myna's (*A. tristis*) nest, which contained three myna's eggs and one of the Koel. This was found on a peepul tree at Anarh Fcty., a few miles from here. I sent a note to Mr. Stuart Baker about it, which he intended quoting in his notes on the Cuckoos. As he has not done so I now send it as it is, I believe, the first time that this has been noted, and it appears to me to be worthy of record.

CHAS. M. INGLIS.

BAGHOWNIE FCTY., DARBHANGA, T. S. RY.
29th March 1908.

No. XV.—ON THE NESTING HABITS OF THE SMALL INDIAN SPOTTED EAGLE (*AQUILA HASTATA*).

With reference to Mr. Whymper's interesting note (page 187 of this Vol.) on the habits of *Aquila hastata* while nesting, and in which he asks if any one had noticed a similar tendency on the part of this eagle to move its eggs when disturbed, I may mention what possibly was only a coincidence, but may have been also an instance of this kind. The only nest I ever obtained of *Aquila hastata* was in the Tumkur district of Mysore, and was as long ago as March 1878. An eagle's nest was reported to me, but not visited for two or three days. When I went to visit it, I found it empty, but an eagle flew from a very small tattered looking nest on a tree some fifteen yards from the other. I shot the bird (now in the South Kensington Museum) and she contained a shelled egg which was broken by the shot. The nest contained a single fresh egg. I found beneath the original nest the remains of a broken eagle's egg. At the time I considered that owing to wind or some disturbance the egg had fallen from the original nest, and that she had consequently deserted and taken possession of a previous old nest to lay again. The circumstances, however, might quite be that being disturbed by the man who told me of the nest, she had tried to move her eggs, and dropped one in so doing.

J. DAVIDSON.

32, DRUMSHEUGH GARDENS, EDINBURGH,
January 25th, 1908.

No. XVI.—THE OCCURRENCE OF THE AVOCET (*RECURVIROSTRA AVOCETTA*) IN ASSAM.

In December last a bird of this species was brought in by my collector. As Blanford mentions it does not occur in Assam, I think it, having been procured in the Goalpara District, worth recording.

A. M. PRIMROSE.

BAGHOWNIE FCTY., DARBHANGA, T. S. RAILWAY,
29th March 1908.

No. XVII.—THE FLAMINGO (*PHŒNICOPTERUS ROSEUS*) IN THE DARBHANGA DISTRICT, TIRHOOT.

On the 22nd November 1907 three of these birds were brought to me by a *mir-shikar* who had shot them. There were only four of them and they were feeding along with some white storks. As this is a very rare bird in Bengal I send this note.

CHAS. M. INGLIS.

BAGHOWNIE FCTY., DARBHANGA, T. S. RAILWAY,
29th March 1908.

No. XVIII.—NOTE ON THE WHITE-FRONTED GOOSE (*ANSER ALBIFRONS*).

Capt. E. E. Forbes shot a Goose yesterday three or four miles from Cawnpore on the Ganges. This was one of a flight of five.

It is undoubtedly *Anser albifrons*. I forward the note as I see Blanford states that this species "is a rare cold weather visitor to the Punjab, Sind, Cutch, Rohilkhand and Oudh, usually occurring on rivers singly or in parties of two or three."

H. FULTON, CAPT.

CAWNPORE, *26th January* 1908.

No. XIX.—OCCURRENCE OF THE CRESTED TEAL (*EUNETTA FALCATA*) IN JULLUNDUR DISTRICT, PUNJAB.

I am sending you what I believe to be the skin of a Crested or Bronze-capped Teal shot by me on the 15th February 1908 at Rahon in the Jullundur District, Punjab. A flight of five of these birds flew over me. I shot two but as the second fell some distance away in water I went to fetch it and in the meanwhile the first bird which apparently fell dead on dry land disappeared. So far as I could judge in the bad light the flight contained two drakes and three ducks. I shall be glad if you would let me know what the specimen is. If it is any use to the Society I shall be glad to present it.

L. C. GLASCOCK,
SUPT. OF POLICE.

THE FORT, PHILLAUR, PUNJAB,
18th February, 1908.

[The specimen, which has been identified by Mr. Kinnear, is a skin of a fine male Crested or Falcated Teal (*Eunetta falcata*), an occasional winter visitor to Northern India. Most of the examples have been obtained in the North-East of India but several have also been shot west of Lucknow, as far as the Nara Valley, Sind, where one was procured in June 1901 and was recorded in our Journal, Vol. XIV, p. 149.—EDS.]

No. XX.—NOTES ON BIRDS FOUND AT BANNU, N.-W.F. P.

The following short notes on rare avine visitors to this part of the N. W. F. P. may be of interest. The occurrence in Bannu of the Waxwing (* *Ampelis garrulus*) and the Dusky Thrush (**Merula fuscata*) has already been recorded in the notes to Vol. XVII, No. 4, and No. 1 of the present Volume of this Journal.

(397)—THE DESERT TREE-WARBLER (* *Hypolais obsoleta*)—♂, adult, 8th September.

The above example was one of a flock of 4 or 5, apparently of the same species, seen on the grass-farm. At the time, the autumn migration was at its height and there was a great rush of the smaller passerines through the district "The Desert Tree Warbler" is a rare species and the skin of this example, which now lies in the British Museum, makes only the 5th, all told, and the 1st from India, that collection contains.

(592)—THE GREY-HEADED FLYCATCHER (**Culicicapa ceylonensis*)—♀, adult, 27th October.

This bird has not, I believe, hitherto been recorded so far to the West of the Empire. The above example was shot in the public gardens, others were seen in the same place on the 12th January and 2nd February; on both occasions after heavy rain. This beautiful little Flycatcher has the typical habits of its family and returns most persistently to the same perch. The note is a "twīt" "twīt."

(642)—EVERSMANN'S REDSTART (*Ruticilla erythronota*)—♂, adult, 19th January.

Although not uncommon in cold winters in the adjoining district of Kohat "Eversmann's Redstart" is a rare bird in Bannu and the above example is the only one I have met with here. It was in perfect winter plumage.

(716)—THE BLACK-THROATED ACCENTOR (*Tharrhaleus atrigularis*)—♂, adult, 12th January.

This bird is also rare in Bannu. The bird shot was one of three seen perching on the topmost branches of a bare mulberry tree.

(792)—THE PINE-BUNTING (*Emberiza leucocephala*)—♂, ♀, adult, 27th December.

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* Skin identified at the British Museum.

Owing to the rich cultivation and to the absence of "rakhs" and jungles, beloved of the *Emberizinæ*, buntings are not common in the district. Last year although I saw a few I failed to obtain specimens. This year, however, more seemed to be about, probably owing to the extension of the area devoted to grass-farming. Among others of the family, I came across a large flock of "Pine Buntings" and obtained the above examples. In both cases the crops contained germinating grains of wheat and the flock must have been doing considerable damage in the fields.

THE MEADOW PIPIT OR TITLARK (*Anthus pratensis*)—♂, adult, 12th January; ♂, adult, 19th January; ♂, adult, 6th February.

This bird is a late cold weather visitor to the district. It is generally to be found among flocks of *A. spinoletta* (though I have seen flocks composed entirely of *pratensis*). Through glasses it can be distinguished from "*spinoletta*" by the well defined black streaks on the breast and the olivaceous brown coloration of the upper plumage, also by the lighter colour of the legs. In my search for this species in the autumn I shot several *A. trivialis* which were seen feeding in marshy places. The two birds are very similar in plumage but the hind toe clearly separates them and to some extent the bill. The first example was obtained for me by Mr. G. T. Dennys, 31st Punjabis, on the grass farm.

(986)—THE GOLDEN-BACKED WOODPECKER (*Brachypternus aurantius*).

This well known bird is a "rara avis" in this corner of the Empire and I have only met with a solitary example.

For the reasons given in the case of the buntings, woodpeckers are poorly represented in Bannu.

(1027)—THE BLUE-TAILED BEE-EATER (*Merops phillipinus*)—♀, adult, 6th September.

Both this species and the Egyptian Bee-eater (**M. persicus*) occur as summer visitors and breeding species in the district.

(812)—THE PALE CRAG MARTIN (*Ptyonoprogne obsoleta*)—♂, adult, 1st December.

A small flock of these birds were seen on two or three occasions hawking over a marshy spot near our battalion training camp, in the Gumatti hills, out of which I, with difficulty, secured the above example. I have since seen solitary individuals of this species far out in the plains.

(1587)—THE SHELDRAKE (*Tadorna cornuta*).

The mud flats in the Kurram river where it debouches into the sandy plains of Bannu are favourite resting places for wild duck. Here the birds are, owing to the quicksands, quite unapproachable. But through glasses they offer an interesting study especially during the spring migration, when a thousand or more may be seen together, asleep or preening themselves. On such occasions I have twice observed the common Sheldrake in beautiful breeding plumage.

H. A. F. MAGRATH, MAJOR.

BANNU, N. W. F. P., *8th February* 1908.

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* Skin identified at the British Museum.

No. XXI.—SOME NOTES ON BIRDS' NESTING IN BURMA.

Herewith some short notes concerning the nesting of some rare birds received from Mr. K. C. MacDonald.

(25)—The Burmese Jay (*Garrulus leucotis*).

"A nest containing two fledged young birds was found at Taok, Toungnyin Valley, Moulmein Division, 25th April 1907. It was 5"×2½" placed in an airy bundle of twigs 1 foot × 1 foot deep, in small sapling about 15 feet from the ground in the open jungle within 50 yards of the civil Police Post. Very like nest of the Hooded Racket-tailed Magpie (*Crypsirhina cucullata*) shown me at Mongwa."

(191)—The Indian Blue Chat (*Larvivora brunnea*).

"Found breeding at 6,000 feet between Victoria, Chin Hills. Several nests in holes in tanks, birds both shot and snared off nest. Eggs pale *spotless* blue."

This is I believe the first record of this bird from Burma.

(205)—The Grey Sibia (*Lioptila gracilis*).

"Nest containing two hard set eggs, was found 6,000 feet Mount Victoria, Chin Hills, 7th May 1906. Bird shot off nest which was on the extreme end of a branch about 25 feet from the ground. Eggs pale greenish blue with numerous pale brown markings very like a small light coloured English Blackbird's egg."

I believe this is the first record of this bird from Burma.

(461)—Hill Warbler (*Suya superciliaris*).

"An oval nest with lateral entrance fixed on the branches of small shrubs growing in grass, about 2 to 3 feet from the ground. Eggs pale greenish blue spotted with brown."

This year at Thandoung I found four nests of this bird, one with 4 eggs, one with 3, and another with young birds. In two cases the nest was within a few feet of the ground in grass. The one with young and an empty one were in small shrubs about 4 feet from the ground. The nests were small untidy grass ovals with a side entrance and very like an unfinished Munia's nest and quite unlike Suyas nests found by me in the Shan States which were beautifully woven cylindrical in shape made from the flowering heads of grass. The eggs are also quite different not having the pronounced zone round the larger end, but are a pale bluish green ground colour with larger brown specks.

(611)—The White-tailed Chat (*Pratincola leucura*).

"One nest containing 3 hard set eggs, placed in a mass of grass debris on a sand bank in Lower Chindwin river, Pakokku district (in the plains and not the hills) on 20th February 1906.

Like a nest of the Common Pied Bush Chat, *P. caprata*, but the eggs very pale *unspotted blue*."

(615)—The Dark Grey Bush Chat (*Oreicola ferrea*).

"Several nests in April on Mount Victoria, Chin Hills. Of fifteen eggs taken *not one* was spotted or marked in any way."

(1310 *a*)—THE BURMESE RING DOVE (*Turtur exanthocyclus*).

Decidedly common in the dry-zone breeding from July to September."

H. H. HARINGTON, MAJOR.
(92nd Punjabis).

RANGOON, 31*st December* 1907.

No. XXII.—"VARIETY OR SPECIES."

When I wrote the article "Differentiation of Species" which appeared on page 198 of the present volume of this Journal and noted on the similarity of birds of different species and the difference in others which were simply phases of one and the same species, I had in my mind *Hieraëtus pennatus* (The Booted Eagle) in particular, as a sample of the latter type, though I mentioned others, since I was following up a clue, at the time, which led me to believe that the dark and the light phase of the Booted eagle were *not* simply varieties of the same species, in different plumages, but each entitled to specific rank. Hitherto they have simply been looked upon as one and the same bird and generally accepted as such, and I for one took it for granted, without question, until a couple of years ago, when it struck me, that I had never seen a dark and a light variety together, as a pair, which would undoubtedly happen, occasionally, were they of the same species. Since then, I have watched them very closely and found in all 7 pairs with youngsters, and one eyass was sent me by a friend with the description of the parents, and in not one single case have I found the parent birds of any but the same colour and the youngster in each case resembled the parents. Of the seven pairs found by me and one sent me, five were of the dark variety with young ones resembling the parents and three of the light variety and youngsters the same.

Blanford, if I remember rightly, (not having the volume with me), says that the dark plumage is that of the young bird, but that it has been known to breed in this plumage. There can be no question about the latter part of this statement for, as I have mentioned above, I found 5 pairs breeding in the dark plumage and the progeny in each case dark, but that the dark plumage is that of the young bird alone I very much doubt, as what about the 3 eyasses in light plumage?

If the two plumages are only phases, it is a most extraordinary coincidence that in every case I have come across, dark has paired with dark and light with light and the young ones too resembled the parents.

In size, habits and flight and also the call, there is no difference so far as I can see, between the two, but in colouring, particularly when on the wing there is little or no resemblance. The dark variety when soaring, looks very like a kite, except for the smaller and rounded tail and a faint white line running along the edge of the wing, due to the tips of the primaries and secondaries being tipped with white and a similar line, in some, on the end of the tail. The light variety on the other hand from below presents an appearance, something like an adult *Neophron* the colour being dirty white with only the last two or three inches of the wing feathers black.

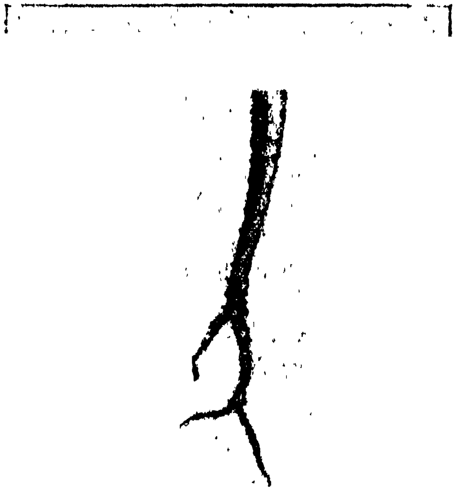
The bird is by no means rare and both varieties or species, as the case may be, breed in the Himalayas from 6 to 9,000 feet altitude and almost invariably on a deodar tree, so if any sportsmen coming across a pair would take note of the colouration of both parent birds and the youngster, if any, and report their experience in the Journal, we should soon be able to judge whether we have been dealing with 2 phases of the same species or whether each constitutes a species in itself.

Buteo ferox (The Long-legged Buzzard) is another species that might be watched, as I have noticed, that only the light variety is a visitor to the plains during the winter and very common everywhere, but I never remember seeing the dark form actually on the plains, though I have occasionally met it along the lower hills, yet in the spring and autumn both are very common at about 5,000 feet. I have never found their nest however, though I have seen and shot young birds in both light and dark plumages.

C. H. DONALD, F.Z.S.

BUSHAHI STATE,
SIMLA DISTRICT, 20*th April* 1908.

No. XXIII.—ABNORMAL TAIL IN A LIZARD *HEMIDACTYLUS GLEADOVII.*



I send a specimen of the lizard *Hemidactylus gleadovii* with a trifid tail.—The occurrence of a bifid tail in this species and bifid and trifid tails in other lizards has been observed on in Vol. ix, p. 30 and Vol. xi, p. 680 of our Journal. The specimen sent was caught on the wall of the dâk bungalow here. It appeared to be inconvenienced by its complicated tail and moved sluggishly and was easily caught. As the tail has been somewhat bent by packing I may add that in life it had the appearance of a normal straight tail with two supplementary tails attached on the left hand side of the lizards main tail.

From an examination of the scaling, however, it would appear that the main axis of the original tail has been bent to the left from the second projection, and the first projection and the portion which now continues (the main axis behind the second forking) are regenerated portions. There is also a curious twist in the scaling at the second fork.

G. A. D. STUART, I.C.S.

CAMP, CHINGLEPUT DIST., MADRAS,
26th January 1908.

No. XXIV.—NOTES ON THE COMMON INDIAN CROCODILE (*CROCODILUS PALUSTRIS*).

In the hope that the subject may be of some interest to members of your Society, I beg leave to ask for the favour of any information you can give me regarding a curious condition of the skins of crocodiles, which has recently come under my notice.

Several crocodiles shot in the Jumna near Delhi lately, by myself and some of my friends, have had marks on their bellies which look like scratches, or the cicatrices of sores; and one had pinkish spots. These marks were only on the belly and were not found on "Gharial" (*Gavialis gangeticus*), but only on the crocodiles proper (*C. palustris*), which led me to believe that they were the results of slight wounds received in climbing up steep banks into brushwood, a habit I have only observed among crocodiles,—the "Gharial" confining themselves to mud-spits. But Messrs. Shewan & Co. of Cawnpore, to whom I send the skins for tanning, state that they are sores, and that they believe they are due to some epidemic disease which has broken out among the "muggars". They further state that they are receiving skins in the same condition from several different parts of India, and that in 20 years' experience of handling these skins, they have never seen anything like it before.

I should be greatly obliged if you could throw some light on the subject, as it seems to be beyond the knowledge of anyone, Native or European, that I have been able to come across.

P. E. BURN.

DELHI, *24th February* 1908.

No. XXV.—EXTENSION OF THE HABITAT OF THE SNAKE *ZAMENIS FLORULENTUS.*

When Mr. Boulenger's Catalogue, Volume I, appeared in 1893, *Zamenis florulentus* had only been recorded from Egypt, where it appears to be a common snake, as no less than 19 specimens were then preserved in the British Museum.

A short time ago I received a specimen, which I identify as this snake, from Sir A. H. McMahon obtained in Quetta, so that we must now include it among our British Indian Ophifauna.

It accords well with the description given in the Catalogue as regards lepidosis, and colouring.

The *præoculars* are two, the upper touching the frontal; beneath the lower a subocular is wedged between the 4th and 5th supralabials. The supralabials are 9, and the 5th and 6th touch the eye. There are three anterior temporals

The posterior sublinguals are subequal to the anterior pair and the fellows quite separated. The ventrals are 216 and obtusely angulate, anal divided and subcaudals, 93, divided. The costals are 21 two heads length behind the head, 21 in midbody, and 15 two heads length in front of the vent; keeled obtusely except in the 3 lowest rows anteriorly, and the lowest posteriorly. It is about 20 inches in length. The colour is like that of paletea and milk. A vertebral series of dark cross bars alternates with a costal series, the spots in the latter being frequently broken into two. Head finely vermiculated and spotted with symmetrically disposed marks. Lips finely mottled anteriorly, a dark black-edged postocular streak passes to the gape. The belly is yellowish finely specked, especially laterally.

F. WALL, MAJOR, I. M. S., C.M.Z.S.

DIBRUGARH, ASSAM, 2*nd March* 1908.

No. XXVI.—CURIOUS BEHAVIOUR OF MAHSEER (*BARBUS TOR*).

After many days of fruitless labour in a stream which should have contained a large number of sizeable fish, but which, owing to the unfortunate absence in India of protective legislation, was, as usual, but sparsely populated, my spoon bait was eventually taken. In common with all true fishermen I experienced the exhilaration which accompanies this somewhat rare event, and very quickly realised that I was at one end of a line and a good fish at the other. It is not my object, however, to endeavour to recapitulate the details of a "memorable fight" followed, as it was, by a period of stagnation to which the euphemistic name of "sulking" has been somewhat appropriately applied. By dint of a little manipulation I had got my quarry on terms of comparative intimacy. In other words, he was being gradually and ignominiously hauled along side. The important office of landing was kindly undertaken for me by that well known and keen sportsman in the Southern Maharatta country, Mr. W. W. Coen, while my brother, as a budding amateur, watched events. The fish struck us as remarkably "game" in view of the powerful 15′ splitcane steel centre rod in use. As, half drowned, he was brought within view we saw, to our surprise, that the captured fish was not alone! A companion of about the same size was at his side and it was only the vision of a landing net a foot from the end of its nose, some 5 minutes later, that induced this remarkable companion to disappear. It looked all along just as if the captured fish was receiving that support which a fellow creature much higher in the scale of Natural History has every right to look for, and the circumstance may, I hope, be considered sufficiently interesting and unique to deserve this bare record. It is well known that many species of fish are highly gregarious; but we have yet to learn that they will give all the moral support in their power to a companion so obviously in distress.

W. A. WALLINGER, C.M.Z.S.

CAMP KALKERI, DHARWAR, *March 7th*, 1908.

No. XXVII.—ESTUARY FISHING IN INDIA.

To few people in England do the names bamin and nair convey any meaning, and it is extraordinary also how little is known of these excellent and most sporting fish by dwellers in this land of exile. Ask any Anglo-Indian about fishing in India, and whether he himself be a disciple of Izaak Walton or no, his first remark will be "mahseer." A few non-fishermen will get no further, though others will, perhaps, hazard murral and chilwa, and—with recollections of occasional glimpses at menus—seer. But once effect an introduction between the angler and the bamin or nair, and he will be so charmed that it will never be his fault if the acquaintance is allowed to drop. The bamin, pronounced bar-meon (*Polymenus tetradactylus*), is, perhaps, more like a salmon than any other Indian fish, while the nair (*Lates calcarifer*) is a heavy, deep fish, which runs to as much as 60 lb. Both are sea fish, though they frequent the estuaries, running up with the tide in pursuit of the small mullet on which it is their delight to prey. For many fish are advocates to be found who claim each that his favourite is the most sporting fish in the world. But that must necessarily be a matter of opinion ; the simplest way would be to divide fish into four or five classes, according to the sport they gave ; then assuredly would both the nair and the bamin rub shoulders with the salmon, the mahseer, and the tarpon in the first class.

And to fish for them. Undoubtedly the part of India that offers the most attractions to the angler is the west coast. Here in Malabar are innumerable backwaters cutting their way through a fringe of golden sand and intersecting miles of low-lying land and bright green paddy fields. To the lover of nature the beauty of the scene leaves little to be desired. In the early morning, as one stands on one of the quaint old wooden bridges that carry the main road through Calicut to Cannanore, beneath one's feet glows the blue-green of the backwater merging a few hundreds of yards away into the glorious azure of the sea. Around, the palm trees and the deep green of the mango are in vivid contrast with the bright red soil of Malabar, while on the still air lies heavy the scent of innumerable frangipani trees, nestling here and there among the huts that dot the banks of the estuary. And seaward the white sails of the fishing boats, lit by the rising sun, look like driven snow, while landward, in strange contrast tower the forest-clad mountains of Coorg and the Wynaad.

One's soul, however, though soaring in day-dreams inspired by the beauties of nature, is soon brought back to Mother Earth. A heavy splash in mid-stream and a prolonged "Ah—h !" from the attendants assure one that the big fish are coming on the feed. For these fish at some seasons of the year have their meal hours most rigorously marked out for them. At certain times in the tides the bamin and the nair begin to run up or drop down the estuary, feeding the while on the shoals of mullet which scatter like chaff before their voracious foes. And if the angler be ready at that appointed hour he may rest assured that sport of some kind will be his. First and foremost comes the question of bait, and that should be a matter of no difficulty. The abovementioned small grey mullet abound in the estuaries, and to their own sorrow form the chief item on the daily bill of fare of such fish as the bamin and the nair. It is advisable when intending a day's fishing, therefore, to send on a man ahead with orders to engage for the day a local fisherman, who with his net will soon capture a sufficient supply of bait. A fairly powerful rod is required, but it must not be too heavy, since in fishing from a bridge—which, by the way, is a far pleasanter method than fishing from a boat—when one stands under the full blaze of the sun, the more exertion one can spare oneself the better. A good 14ft. greenheart, used with a short spinning top, making the rod about 12ft. long, is an excellent weapon. On it should be a good reel holding some 150 yards of stout salmon line, a strong pliable wire trace, and a spinner for natural bait. As the bait is fairly heavy—a small mullet of about 3 in. is a good length—and as one fishes from a bridge with a clear field of action all round, it is surprising what long casts can be made.

To pass now from theory to practice. One April morning, when the sun's rays are just topping the blue mountains of the Wynaad, N. and I settle to our twelve-mile drive in a jutka—this latter the cart of the country, a species of small bandbox, with two rats of ponies. On the roof sits N.'s orderly, holding on to the tiffin basket with grim determination, my orderly having already preceded us the night before, with strict injunctions to have a goodly store of small grey mullet awaiting us. Our destination reached, the tackle is unpacked and leisurely put together. At present there is no hurry; the estuary flows placidly to the sea, its surface unbroken, save for the light caress of a passing zephyr, a zephyr later on freshening into one of those steady breezes from the sea which by a merciful dispensation of Providence usually rise during the midday hours of the hot weather, thereby tempering pleasantly the sun's rays, which otherwise would be uncomfortably warm. Barely have our rods been fitted together, and even as the open jaws of the crocodile spinner gape ready for the small mullet (which Ahmed, the fisherman, is deftly flicking on the head), when there comes a plunge out in mid-stream. Then as eager eyes scan the ruffled surface the fish, a bamin of about 8 lb. leaps again—a glorious flash of silvery spray. N. is ready first, and out swings his bait in a long cast; but the bamin has shifted his position, and now leaps again further out in the stream. For a space all is still, then two more fish leap in quick succession, and we start spinning in earnest. At my fourth cast, as the bait touches the water a fish seems to leap towards it, and, heart in mouth, I wait the sudden tightening of the line. But he has evidently come short, as nothing happens.

A few more casts, and then as my spinner nears the arch of the bridge a gleam of silver shows for an instant, and before I have time to "throw in" the check of my Silex reel the line is tearing off swift and silent. A movement of the thumb, however, and the voice of the reel rises in that long-drawn-out scream so dear to the angler's heart, and the fish soon begins to feel the strain. Luckily he has elected to run out from the bridge, but I know well that it is only a matter of minutes before, his wild rush ended, he will make a dash back towards the friendly shelter of the wooden piles. This is the greatest danger with these fish, and though it certainly adds to the excitement of playing them it helps to wear one's temper thin to lose perhaps four good fish in a day owing to their rushing under the bridge and taking a double turn round one of the piles. True, if a boat is moored handy below the bridge it is possible often to drop into it and then to unravel the line, but even so many a good fish breaks hook hold, while others go of with a favourite spinner and a few yards of trace and line trailing behind them.

But my fish is still well away in mid-stream, as, reaching one end of the bridge, I laboriously climb the parapet and negotiate the 6 ft. drop to the bank —no mean feat, considering that the strain must never be relaxed for an instant, since so bony are the mouths of the nair and bamin that many a fish apparently well hooked tears himself free just when the fight appears over. Till now my fish has shunned the public gaze, but, the restraint apparently proving irksome beyond all bearing, he suddenly rewards us with two magnificent leaps to the huge admiration of the throng of spectators now gathered upon the bridge. During each leap my heart ceases to beat, continuing only when my rod-top, dipping in salute, shows the fish to be still on. Whether the bridge catches the fish's eye in mid-air I know not, but he now begins to move back towards the wooden piles. But he is too late, as by this time some twenty yards lie between the bridge and myself. Still, he fights gamely, and another five minutes elapse before Ahmed proudly lifts him out—a nair of 10lb.

Hardly have I finished admiring my capture when a halloo from N. conveys to me the fact that he also is fast in a fish. Clambering back on to the bridge I find him in difficulties. His fish is less considerate than mine, having run under the bridge and up the estuary, N. meanwhile—in imminent risk of apoplexy—leaning over the rail with rod upside down. Luckily, though, his fish, a 4½lb. bamin, is unable to fight for long against the powerful strain of stiff rod and wire trace, and gradually is drawn back to below the bridge, whence he is towed along towards the bank. Here, however, the sight of the expectant Ahmed frightens him, and he makes an unexpected and violent rush all but fouling one of the piles; but, his last effort finished, he suffers himself to be lifted out without more ado. Barely five minutes pass before I get another run, the fish, a bamin of about 6lb., making a dash of thirty yards or more, and then one magnificent leap during which he and I part company, to my sorrow. A short period of labour without result, then luck is with me again, and a 7lb. bamin proves amenable to the same tactics as sufficed for the nair fish.

Afterwards N. hooks a big fish, which incontinently takes three turns round the piles under his feet and is loose, the nautical flavour of N.'s remarks sufficing to put all the fish off their feed for the next ten minutes. His trace and spinner are eventually recovered for him by a youth, who, after being heavily bribed, succeeds in swarming down among the rafters and unravelling the tangle. By this time the fish are going off the feed. Luckily for N.'s peace of mind, however, he manages to hook and land one belated diner—a bamin of 7½ lb.

Not the least fascinating part about the fishing is the uncertainty as to what species of fish will take you. If it is a bamin or a nair, you will not usually be in much doubt as to which you have hooked. The former comes at your bait with a swift dart, with something of the rush of a mahseer. The nair, on the other hand, rises slowly, a great gleam of silver, and deliberately mouths the bait before turning down with it. Also at times you may feel a vicious tug, and see a rose-coloured flash, when *Lutianus roseus*, the red rock perch, chips in among his betters, to honour your basket and increase its weight. But, given any of these fish well hooked, you will find him a foeman well worthy of your steel.

(*From " The Field ", January 4th*, 1908.)

SKENE DHU.

No. XXVIII.—SEVERE EFFECTS FROM THE STING OF THE COMMON INDIAN HORNET (*VESPA ORIENTALIS*).

It is not generally known, I believe, that the sting of the common Indian hornet, *Vespa orientalis*, may give rise to serious symptoms, so, the following may be of some interest.

CASE I.—A sepoy of the 53rd Sikhs was stung in the axilla at about 8 p.m. on September 1st. In about a minute he fell down in a semiconscious condition, and was immediately carried to hospital on a charpoy. On arrival he was pale and somewhat cyanosed. He was sweating, the pupils were contracted, and the extremities were cold. The respiration was shallow and sighing, and the pulse 130 or 140, feeble and irregular.

He was treated with strychnine, hot water bottles, &c., and the pulse soon became regular and stronger, but he remained cyanosed, and complained of a tightness in the throat for about 1½ hours, a slight œdema of the eyelids and face developed also. At 10-15 he had a short but severe rigor at the end of which his temperature was 101·4 F.

Next morning the temperature was normal and except for a little weakness and fatigue the patient was well again.

CASE II.—Three days later another sepoy of the same regiment was stung on the head. He at once started for hospital, but became faint on the way and fell down two or three minutes after he was stung. He was carried to hospital. He also had a feeble and irregular pulse and he complained of a feeling of oppression in the precordium and of constriction in the throat. I first saw him about half an hour later, when he was very blue in the lips, and the respiration was shallow and feeble. The pulse was about 110 and small. There was no œdema. About an hour later he felt a chill which was of short duration, and the temperature rose to 100·6 F. A few hours later he was all right again.

Both the above men were in excellent health at the time of being stung, and both were quite certain what insect it was that had stung them.

CASE III.—A native officer of the 57th Rifles was stung a week later by an insect which he did not see, but from the symptoms I think it must have been the same. Almost immediately he felt faint and was brought to hospital. He was cyanosed, the respirations were feeble and shallow and the pulse irregular and weak. His face and neck became very œdematous. The temperature only rose to 99·2, and he was able to leave hospital in a little over an hour.

These hornets are very common here in Peshawar, and I have seen several other cases of stinging by them, but without constitutional symptoms. It is curious that these cases all occurred within about ten days. About the same time I heard of a native being stung by a hornet and dying on the way to hospital, but I cannot verify the story.

R. C. MACWATTERS, CAPT., M.B., I.M.S.

PESHAWAR, *April* 1908.

No. XXIX.—THE CLASSIFICATION OF THE LEPIDOPTERA.

In the *Field* of 18th January 1908 appeared a review of Mr. South's book on the *Moths of the British Isles*, which is described as "the most useful book for the identification of specimens that has so far appeared from the press." The volume in question ("First Series") deals only with some eight or nine families. It is not however with the British representatives of these that the general run of amateur naturalists in India are particularly interested, but with the references to the modernised classification of the whole of the Lepidoptera, which is apparently dealt with in the introduction to the volume, and with the radical changes that are adopted in the long standing names of well-known species.

I am in no way an expert in the classification of the section of Lepidoptera so long familiar to us all as moths or Heterocera, which have been looked upon as very clearly separated from butterflies or Rhopalocera, so that I do not attempt to criticise. It will nevertheless, I venture to think, cause many of us something akin to consternation to learn that the former separation of butterflies and moths according to the distinction in the antennæ no longer holds good in the judgment of systematists, who now "consider that there is no well defined line of separation between butterflies and moths, consequently by modern classification butterflies. . . . are placed among various orders of the moths." If this innovation and revolution of our formerly accepted ideas is capable of sufficiently sound demonstration to obtain the recognised adoption of systematic lepidopterists throughout the world, the sooner the amateur dabbler in the science sets about adapting himself to the new order of things the better, just as those did who realised the force of Darwin's arguments that revolutionised the general scheme of all biological study forty years ago, although there are bound to be a few old stagers who will persist in the contention that the names and arrangement of classification, which has been good enough for them and those before them for perhaps a century, must therefore be good enough still. At the same time there is no possibility of denying the extreme inconvenience of such sweeping changes as are now put forward in the classification of the Lepidoptera. As an instance of this I will only mention that out of seventeen British species of *Sphingidæ* (Hawk Moths) twelve have been assigned new generic names in Mr. South's book. If this is the case with British species how much more apalling will be the changes we shall have before us in the Indian? And if so of the *Sphingidæ*, how much more in the *Geometridæ*? We are already acquainted with instances of Indian moths having attained the proud distinction of accumulating a series of as many as twenty different names, but much worse than that would now appear to be before us.

In Col. Bingham's Introduction to the first volume on Butterflies (Fauna of British India) he alludes to Comstock's division of the Lepidoptera without saying whether he accepts it or not for the order generally. So far as the butterflies are concerned he accepts Meyrick's sub-order Papilionina (=Papilionina + Hesperiina of Comstock) and from this one must presume he does not agree entirely with the latter.

My object in writing this note is not to carp at the revolution, but in the hope that one of our members may see his way to help the generality of Indian workers at the Lepidoptera with a brief account of the new classification and of its principles, if it is going to be a permanency for the time being and not only the crank of a faddist.

E. COMBER.

BOMBAY, *26th March* 1908.

No. XXX.—CANNIBALISM IN CATERPILLARS.

With reference to Mr. C. E. C. Fischer's note on Cannibalism in Caterpillars the last journal, the following facts may be of interest.

Among Lepidoptera, *Spalgis epius* among Lycænids, *Eublemma amabilis*, *E. cretacea*, *E. coccidiphaga* and an undescribed species of *Eublemma* among Noctuids, and *Hypatima doleropa* and *H. pulverea* among Tinoids habitually feed upon Lac insects or upon Mealy bugs (Dactylopius and allied genera). These are not cases of cannibalism but of "flesh eating". Cannibalism is a frequent feature of the more robust Noctuid larvæ kept alive in the Pusa insectary, even with sufficient food. In particular, the genera *Agrotis* and *Euxoa* *Chloridea* (Heliothis), *Prodenia*, *Spodoptera*, *Caradrina* and *Cirphis* (Leucania) exhibit it; with insufficient food, only one larva of a batch survives, but even with sufficient food, mere contact is enough to provoke one caterpillar to take a bite out of another. Cannibalism of this kind is not the least of our difficulties in rearing Lepidoptera and is quite frequent in Noctuids. There is reason to think it occurs commonly also in Pyralids in nature, particularly in the boring species; we know that many eggs of Chilo and Scirpophaga are laid on a shoot of cane; we know that these hatch and many larvæ descend into the shoot and are found there together while young, but only one survives eventually and we have been unable to decide what happens to all the remainder; some, we know, migrate, but in no case has it been satisfactorily shown that all did, and my personal opinion is that a good deal of cannibalism goes on. It is probably quite a common thing in nature under these circumstances, only we cannot see it.

H. MAXWELL-LEFROY.

PUSA, 19*th May* 1908.

No. XXXI.—ALLEGED SHOWERS OF WORMS.

Of late various specimens of worms have often been sent for identification to our Society from different parts of the country, the senders in most cases stating the natives believe they have fallen in showers from the skies.

These worms belong to two classes and are generally of two genera,—*Mermis* and *Gordius.*

Mermis belongs to the *Mermithidæ*, a family of the Nematode class.

The adult sexual form is frequently found in great numbers in damp earth or climbing up the stems of plants after a heavy rain storm, especially in the early morning. Being a Nematode worm it has a pair of lateral lines, the oral papillæ are six in number; the males possess two copulatory spicules, and numerous aboral papillæ arranged in three rows. The eggs are laid in moist earth, the larvæ, on being hatched make their way into the body of a grasshopper or locust and feed on the fat-body of their host. On the death of the insect, or perhaps before it, they make their way into the gut and escape by the anus.

It is amazing what a number of these large worms can be accommodated by a locust. In Assam I have seen the great majority of a flight of locusts inhabited by these worms, the weight of those that escaped exceeding that of their host whose body was reduced to a mere shell.

A flight of locusts perishing during the night giving posthumous birth to a host of worms will very naturally be looked on as a supernatural "shower of worms" by uneducated observers. Especially will this be so when the death of the insects is due to inclement weather.

A district in which these worms have not before been observed may be suddenly invaded by a flight of infected locusts. The worms will escape without attracting notice and hide in the soil. Should a heavy shower fall during the night the worms come to the surface and may be seen in huge numbers climbing and writhing around the stems of plants.

The worm is of course unsegmental, but differs from other *Nematodes* in that it has no anus.

GORDIUS.

Another of these worms that has been said to fall in showers is *Gordius*. It is often suddenly seen in puddles where formerly it passed unnoticed. The obvious inference of the untutored savage is that they have fallen with the rain that made the puddles. Several of the worms are often found wound together in a tangled knot,—whence the name Gordius.

The male may be readily distinguished by the " tail" end being split. The female genital opening is also at the aboral end. Specimens can often be seen in copulation.

The Gordians constitute a family and with a single other genus have the honour of forming a complete class by themselves.

THE NEMATOMORPHA.

This order has no lateral lines and no oral papillæ. Mermis we have seen has no anus, Gordius has, but is in worse plight as in the younger stages it has no mouth, the gullet being a solid rod—not the least used for eating or even drinking. The gut is straight, as already said, both testis and ovaries discharge their products through a terminal opening and are placed dorsally to the gut.

After the eggs are laid the little embryo makes its way by the aid of spines on the oral end through the body wall of the larva of a mayfly, midge, alder-fly or " Phemtorce larva." This is the only one stage in this strange eventful history. The midge, mayfly, etc., has to be eaten by a beetle. or perhaps a frog or fish. It is said that even man himself has had the honour of acting as host.

The larva then devours the whole of the fat-body, and sometimes even the digestive and reproductive organs of his host who is most often a beetle. If the beetle gets drowned or dies near water the worm escapes in the adult condition in which its main duty is to increase and multiply. The number of eggs laid is enormous, and necessarily so, considering how precarious is the life history of the creature. In its struggle for existence, the larva must find the midge, next a suitable beetle must swallow the midge at the proper stage, finally the beetle who is naturally a land liver, must get drowned or die near some fresh water.

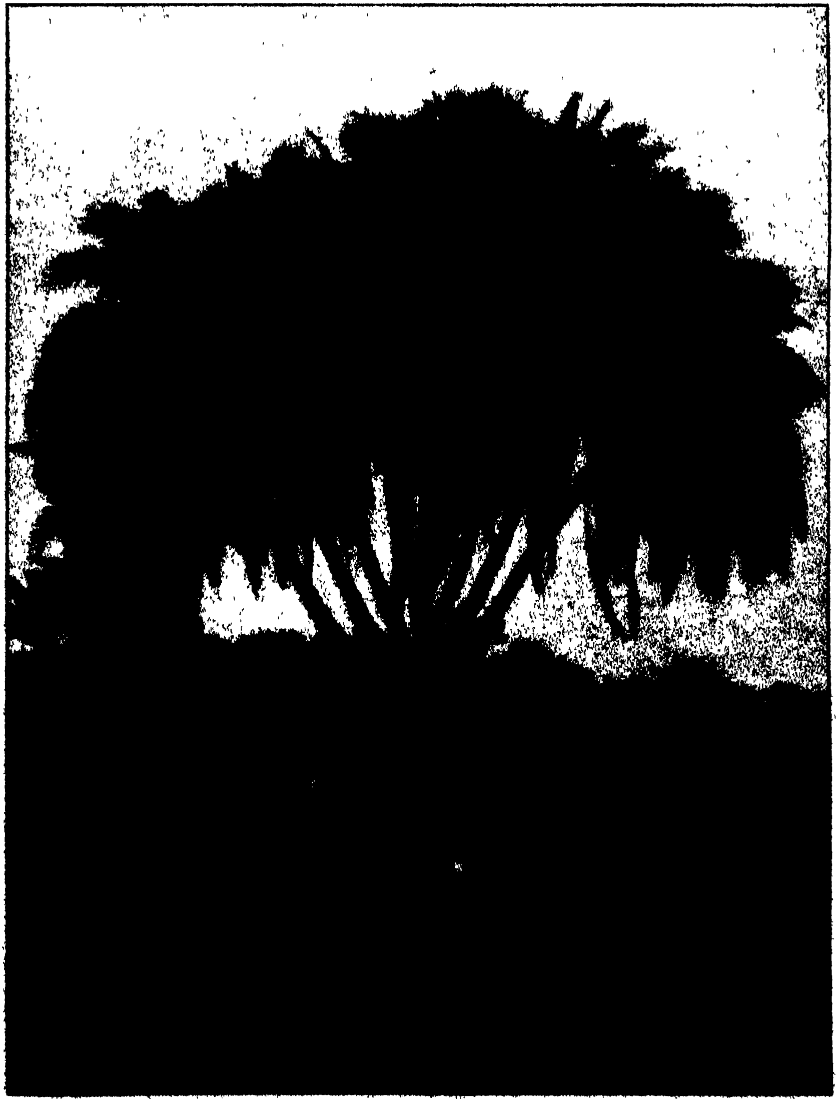
It is a matter for supreme thankfulness that we poor humans lead a less precarious existence. Imagine the number of babies we would have to produce, if only those who succeeded in boring their way into a crocodile grew to childhood, and only those whose crocodile was swallowed by a tiger that died of drowning had a chance of arriving at man's estate !

A. POWELL.

BOMBAY, *March* 1908.

No. XXXII.—A BRANCHING DATE PALM (*PHŒNIX SYLVESTRIS*).

I send a photograph of a curious date palm tree (*Phœnix sylvestris*). This tree was growing at a village named Amas in the Gaya district, but a couple of years ago during a severe hail-storm the top was wrenched off just below where the branches start. The tree had 14 heads or rather branches, each with a separate crown of leaves and each of the branches had been tapped for the juice.



The story is that at one time it was a single tree but was struck by lightning and split, and from the base of the split these branches started. The split is plainly seen in the photograph.

GULZARBAGH, E.I.RY., 25*th August* 1907. F. FIELD.

No. XXXIII—DATES AND DATE-MARKS.

Two of the chief features of Baghdad are the date palm and the local boils which are known as "date-marks." Why this name should be given to them is not easy to understand; many explanations are offered, but none seem satisfactory. Some say that they come from eating dates, but this is certainly untrue. Others maintain that they are so called because they afflict people in date-bearing countries, but this explanation does not hold good either, for Basra is far more the region of date palms than Baghdad, and yet is free from the plague of boils. Another theory is that they are called date-marks, because they almost always begin during the season of the ripening of the dates, and yet another that the name comes from the shape of the scar left, which is generally a long oval, not unlike the shape of the fruit. Some people boldly casting aside any connection between the boils and dates, lay the blame on the unprotesting mosquito, an animal which has become as necessary to the medical profession as the cat to the landlady.

Be the cause what it may, the effect is equally disagreeable. Scarcely any resident of Baghdad, either European or native, escapes from these boils, which in severe cases may cause the loss of the sight of an eye or carry off a bit of the nose or lip. This is fortunately rare, but there is quite a probability of disfigurement for life, resulting from frightful scars on the face. Indeed so real is the danger, that it has been suggested that if the Government of India is anxious to create a new decoration, it cannot do better than recognise the valour of its subjects who have been "sent to the front" in these parts, and issue a Baghdad medal with a clasp or bar for every boil, ladies not to be debarred in any sense of the word? Rude questions to a lady thus decorated as to how many clasps she was embraced by might be disregarded.

Job, who is supposed to have been a native of Mesopotamia, was probably the most eminent sufferer from Baghdad boils, the germs of which were no doubt then lurking in some obscure village, as they will continue to do when Baghdad has gone the way of Babylon and other buried cities of the plain.

The Baghdad boil or date-mark follows the rule of slow growth and long life. It lasts a whole year, beginning in July or August as a small pimple, which grows very slowly for several months, and then becomes tender and swollen, continues as an open sore for some months more, and slowly dries up. Considering the virulence of the sore, it is remarkably little painful, unless it happens to come on a joint or a part much exposed to knocks. Children are the greatest sufferers, and are always attacked on the face; indeed it is rare to see a

Baghdadi without one or more enormous scars on his face, probably dating from his infancy. European adults are often fortunate enough to have the boils on their arms or other comparatively inconspicuous place. These pests may appear in any number, from a single one to several dozen, and an English lady is said to have had no less than 67. Medical skill as to their treatment is strictly negative, and it seems to be established that any sort of remedy only aggravates the disease, which must run its course like measles or small-pox. With the exception of one class of men, almost everybody falls a victim sooner on later, and the two or three in every hundred who are lucky enough to escape are as much puffed up as the people who are proof against sea-sickness; they are apt to talk of the necessity for frequent ablutions and to plume themselves on their superior cleanliness ? That there is *some* connection between the absence of Baghdad boils and water seems clear from the exception above referred to, namely, the men employed in the river steamers, who spend a large proportion of their lives in going up and down the Tigris, though while the ship is in port they are as much on shore as anybody else.

To turn to the pleasanter subject of date palms. These play as important a part in Mesopotamia as the banana in Central Africa, and the cocoanut palm in some parts of India. The Mahomedans are very proud of the date palm tree, and say that it refuses to grow well in any country which is not consecrated to Islam. There are many varieties, all exactly alike in appearance, but differing in the fruit. In Baghdad there are 40 or 50 well-known kinds of dates, some of them bearing romantic names, such as "lady's fingers," and "pretty maiden's eyes." In the Basra district there are even more varieties, as well as a vastly greater number of trees. The palms between Fao at the mouth of the river and Gurna and at the junction of the Tigris and Euphrates are numbered in millions, and each brings in an average income of three or four rupees a year.

The Arabs say there is a separate use of some product of the date tree for every day of the year. I do not propose to enumerate so many, but some of the chief uses are as follows. Dates form a staple part of the food of the poor at all seasons, and the choicer kinds are much appreciated by the rich as dessert. The alcohol drink made from dates and called *arrack* is, of course, well known. The refuse and damaged dates make a particularly good food for animals, and the stones are ground into meal and given to cattle. The leaves are used in many different ways, and make brushes, fans, matting, huts, etc.; the hollow trunks are used as water channels and palisades, and also for building, though any other wood would be better for this purpose; the fibre is made into rope.

The appearance of a country covered with date palms is painfully monotonous, although at first the observer is struck with the gracefulness of their forms. The colour of the foliage is ugly, a dull greyish green, which even in the spring does not take on a brighter tinge; as the season advances, dead and dying leaves hang down against the trunks, giving the trees a quite disorderly appearance until once a year they are cleared away. To look their best, date trees should be seen by moonlight, or with a back-ground of red sunset glow: they then become poetical and romantic, and imbued with the mysterious charm of the East.

There is a mutual dependence between the date palm and the human race, and to ensure a good crop of fruit a considerable amount of labour is needed, which the Arabs, lazy as they are, cannot make over to the women. When the plants are young they want plentiful watering and manuring, and wrapping up in winter to protect them from the frost. The trees are of opposite sexes, and every spring the flowers of the females have to be artificially pollinated: this is done by cutting off a branch of the male flower and carefully shaking it over the females. At this time the insignificant white flowers which have just burst from their sheaths are scarcely seen from below as they stand straight up in spiky clusters: about June men climb the trees and disentangle the bunches from the leaves, bending them till they hang down quite clear. The dates now look like small green beads, strung at wide intervals on green stalks. As they grow larger they change in colour, the stalks turning yellow first until in August they hang in immense bunches of vivid gold, about six or eight on every tree. Picking is no light work, and continues through most of August and September. The Arab climbs the tree very cleverly by means of a sling passed round the trunk and behind his back. He presses his feet against the tree leaning his body outwards, and almost walks up the trunk, jerking the sling up a few inches at a time. The extreme roughness of the bark prevents the rope from slipping, and dangerous as the operation looks, it is really quite safe. When the man gets to the top he sits comfortably on the sling, and picks the dates that have turned brown, first filling a round tray-like basket that he has carried up on his back, and putting any that are over into his capacious shirt front. As the dates ripen gradually this process has to be repeated often, until the bunches dwindle and finally disappear. With the commoner kinds of dates so much trouble is not taken: the bunches are cut off directly they begin to turn brown, and are hung up in the shade for the later dates to ripen. The final operation for which human aid is called in is the cutting off of the dead leaves, which takes place at the end of the cold weather.

Believing as they do that the palm tree is under the special protection of Providence, the Baghdadis consider that the still breathless heat of the end of August is expressly intended for the benefit of the fruit. Some years ago a Wali of Baghdad was complaining of the heat, and received the usual resigned answer, "God sends this weather to ripen the dates." "Is that the reason?" replied the Wali, "then cut all the date trees down!"

Date trees can be propagated by means of seed and off-shoots, but the former is an unsatisfactory method; as the sexes are likely to be equal in trees raised from seeds, and cannot be determined for six or seven years, when the flowers begin to form. As the male trees bear no fruit and two or three are quite enough for a hundred females, this causes waste of time, ground and trouble consequently the method of propagating in general use is to cut off and replant the offshoots which form round the base of the tree from its sixth to its sixteenth year. By this means there is no doubt as to sex, for the females produce female suckers and the males produce males. Date trees live more than a hundred years and bear fruit steadily for all but the first few years of that period, the climatic conditions of the country of their growth being so invariable that the crop hardly ever fails. No wonder the pious Mahomedan looks upon the date palm as the special gift of *Allah* to the faithful.

ZOBEIDE.

(*From "The Pioneer," 23rd November 1907.*)

No. XXXIV.—PLANTS USED IN PAPER-MAKING.

The paper of the ancient Egyptians was made from the stems of a sedge (*Cyperus papyrus*) which grew on the Upper Nile and other African rivers. Until about fifty years ago the various kinds of modern paper used throughout the world were made from rags. The late Mr. T. Routledge was, I believe, the first to try esparto grass as a substitute for rags. In 1861 he obtained a few tons of this grass from Spain, and his success in manufacturing paper from it led to his taking out a patent for his process. By 1880 the annual consumption of esparto for paper-making alone in this country was about 2,000,000 tons, at which figure it has steadily kept since. Esparto is a perennial grass which forms rush-like tufts of narrow, convolute, grey-green leaves; it is related to the marram, and, like it, grows on the sea coasts in Southern Spain and Northern Africa. In the early days of its use for paper-making it fetched as much as £12 per ton; now, however, owing to the competition of wood pulp for the same purpose, esparto realises only about £3. The grass grows wild, and it takes from ten to fifteen years to grow to a full-sized clump, from which the leaves may be pulled, which is done about July. The best paper is made from leaves that are three years old. It would be worth while to test marram for paper-making; its leaves are of the same colour and consistency as esparto, and if this grass could be turned to good commercial account the sand wastes of our coasts, where this grass grows luxuriantly, would then become a considerable source of profit.

The demand for paper-making material soon exceeded the supply of both rags and esparto. It was then that wood pulp, long before known to be suitable for paper-making, attracted the attention of manufacturers. It was tried on a small scale in 1871 and now the quantity imported into the United Kingdom from North America and Northern Europe is over 500,000 tons a year. The bulk of it is obtained from coniferous trees, in Europe the common spruce and silver fir, in North America the hemlock, black, red and white spruce. In addition to these, however, various species of birch and poplar are suitable for the purpose, and where they are plentiful they are largely felled to be made into pulp. Paper being formed entirely of cellulose it can be made from any vegetable fibre, and there are probably a great many other plants, both ligneous and herbaceous, which might be turned to account by the paper-maker. As children we were all greatly impressed by the story of the manufacture of all our dainty papers from the rags collected by the hawkers and rag gatherers. Rags were waste refuse. In like manner much of the produce of the vegetable kingdom, which at present is treated as waste, will be put to some such useful purpose when we are forced to economise.

Wood pulp is made from trees of any age, twenty years being considered best. They are felled usually in winter, cut into lengths of about 12 feet, conveyed to a mill, where they are ground into pulp by hydraulic pressure against revolving standstone grinders. Another process is that of reducing the logs to chips and treating them chemically under that pressure. When dried the pulp is worth from £5 to £9 per ton.

The total amount of paper used annually in this country is estimated at something like a million tons. This includes all kinds of paper, from the coarsest brown to the choicest note. Germany has an output of about the same quantity, whilst the United States of America turn out about two million tons. The total amount of the world's paper production is estimated at over five million tons.

Japanese paper is made from the paper mulberry (*Broussonetia papyrifera*), a tree not unlike the common mulberry. It is largely grown for the fibre and paper-making properties of its bark. What is known as Chinese rice paper is made from the pith of the stem of an Aralia (*Fatsia papyrifera*). In India an excellent paper is made from the stems of several species of Daphne. This paper is remarkable for its tough texture and smooth surface. The paper used for making bank-notes in this country is manufactured from best quality linen, preferably old linen, the effect of wear and frequent washing being favourable to the quality of the paper made from it.—(*Wason in " The Field ".*)

No. XXXV.—FEAR IN ANIMALS.

In Vol. XVII, page 836, of the Journal, a note appeared suggesting an explanation of the fear exhibited by tigers.

I have just come across an article in the February issue of Pearson's Magazine which bears on the subject and as it quotes the words of an authority, which more or less supports the theory advanced, I may be excused if I requote part of them here.

The quotation is from Major Hamilton, Warden of the Transvaal Government Game Reserves, who says :—

" As regards your question as to what I know of signs of fear in wild animals, I am afraid that you, or at least the public generally, will think me guilty of a gross heresy when I say that the impression borne in upon me as the result of a good many years of close study of wild animals and their ways, under circumstances of a rather unique character, is that wild animals have really no instinctive inborn fear of man as such as is generally believed.

"It would rather appear that the apprehension shown by them at sight or scent of man is grafted upon them when young by the examples of their elders, as well as by personal experience.

"Undoubtedly one of the most striking ingrained traits in all animals, without exception, is the fear of the unknown, and any living object not seen before is a source at once of suspicion and of curiosity: if the gratification of the latter feeling gives ground for confirmation of the former, from that day the animal will do his best to avoid objects of similar appearance and odour, while if he discovers a spirit of aggression and a tendency to pursue and injure him, he will soon become exceedingly frightened of what at first merely aroused passing surprise and alarm."

One has the phrase "natural fear of man" thrown at one as if that explained everything. It has always seemed unsatisfactory to me, and indeed untenable in the face of many known facts, such the case of the birds on the Galapagos Islands, which on the first appearance of man were so fearless as to allow themselves to be caught by hand.

C. E. C. FISCHER.

LONDON, 16*th February* 1908.

PROCEEDINGS

OF THE MEETING HELD ON 14TH MAY 1908

A meeting of the members of the Bombay Natural History Society took place at the Society's Rooms on the 14th May 1908, Mr. K. R. Kama presiding.

NEW MEMBERS.

The election of the following 12 new members since the last meeting was duly announced :—

Mr. Leonard J. W. Robinson, R. H. A. (Meerut) : Mr. A. H. Napier, I. M. S. (Rawalpindi) ; Mr. N. M. Jenkins, R. G. A. (Karachi) ; Mr. D. Quinlan, C. V. D. (Calcutta) ; Mr. H. P. Ball (Ajmer) ; Mr. A. F. Brooke, R. F. A. (Meerut) ; Mr. C. de M. Wellborne (Poona) ; Mr. W. P. Pechey (Bombay) ; Capt. E. S. Gillett, A. V. C. (Ahmednagar) ; The Conservator of Forests, Berar Circle (Amraoti) ; The Mess Secretary, 87th Punjabis (Jhansi) ; and Mr. J. Donald I. F. S. (Chanda, C. P.).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions since the last meeting :—

Contribution.	Locality	Contributor.
1 Head of Swamp deer (*Cervus duvauceli*).	North Kamrup, Assam	Mrs. F. F. Jackson.
11 Mammal skins :— Large Indian Squirrel (*Ratufa indica*) Orange-bellied Himalayan Squirrel (*Zetis lokriah*). Black-backed Squirrel (*Sciurus atrodorsalis*). Golden backed Squirrel (*Sciurus caniceps*). *Sciurus prevostii.* Crab-eating Mungoose (*Mungos urva*). Large Indian Civet (*Viverra zibitha*). Small Indian Civet (*Viverricula malaccensis*) Himalayan Palm Civet (*Paradoxurus grayi*) Red Cat-bear (*Ælurus fulgens*) Musk deer (*Moschus moschivus*).		Trustees of the British Museum.
1 Skin of Wild Dog (*Cyon dukhanensis*).	Berars, C. P.	Khan Bahadur Nawab Mahomed Salamula Khan.
10 Mammal skins :— 4 Indian Porcupine (*Hystrix leucura*)... 3 Common Indian Hares (*Lepus ruficaudatus*). 1 Common Langur (*Semnopithecus entellus*). 2 Striped Hyænas (*Hyæna striata*). 2 Jungle Cats (*Felis chaus*).	Hoshangabad, C. P.	A. A. Dunbar Brander.
A number of small Mammal skins, including 13 Afghan Gerbilles (*Meriones erythroura*), 2 Mole Rats (*Nesokia huttoni*). 1 Afghan Mouse Hare (*Lagomys rufescens*).	Quetta District ...	Baluchistan Natural History Society.

Contribution.	Locality.	Contributor.
1 Little grey Hamster (*Cricetus phæus*)...		
1 Barn Owl (*Strix flammea*)	Bandra	Mr. O. Steffin.
1 do. do.	East Khandesh ...	Mr. J. E. C. Jukes, I. C. S
10 Quails: Common Grey Quail (*Coturnix communis*); Rain Quail (*Coturnix coromandelica*).	Thana	Mr. W. S. Millard.
1 Painted Partridge (*Francolinus pictus*) and 1 Red Wattled Lapwing (*Sarcogrammus indicus*).	Andheri	Mr. W. F Rutherford.
5 Birds, including 2 Chiffchaffs (*Phylloscopus tristis*), 1 Brook's Willow Warbler (*Phylloscopus subviridis*), 1 Hodgson's Pipit (*Anthus rosaceus*), 1 Pale Harrier (*Circus macrurus.*)	Kohat	Mr C. H. S. Whitehead.
2 Temminck's horned Pheasants (*Tragopan temmincki*).	Sadon, Upper Burma.	Capt. C. Elliot.
1 Yellow-throated Bulbul (*Pycnonotus xantholæmus*).	Horsely Konda, Madras Presidency	Mr. P Roscoe Allen
10 Birds, including 2 Common Rose Finches (*Carpodacus erythrinus*), White-eyed Buzzard Eagle (*Butastur teesa*), etc.	Andheri and District.	Mr. N. B. Kinnear
2 White-winged Wood Ducks (*Asarcornis scutulatus*).	Mytikyina, Upper Burma.	Mr A. C. Bateman.
20 Snakes, including the following:—*Tropidonotus khasiensis, Haplocercus ceylonicus, Dendrophis caudolineatus.*	Burma, &c. ...	Major F. Wall, I.M.S., C.M.Z.S.
22 Snakes including *Coluber oxycephalus, Coluber prasinus, Simotes violaceus, Rhabdops bicolor, Lycodon fasciatus, Amblycephalus andersoni, Amblycephalus monticola, Callophis maculiceps.*	Burma, &c ...	Majort F. Wall, I.M.S. and Vet. Maj G. H. Evans
1 Snake (*Ancistrodon hypnale*)	Dharwar	Mr. H. M. Dwane.
1 Snake *Lycodon aulicus*, with lizard's legs protruding through stomach.	Etah	Mr. W. P. Cotton, I. C. S.
2 Lizards *Mabuia septemtæniata* and *Gymnodactylus* scaber.	Bushire, Persian Gulf.	Major P. Z. Cox, C.I.E., F.Z.S.
2 Lizards *Hemidactylus* sp. and *Lygosoma albopunctatum.*	Dibrugarh, Assam ...	Maj. F. Wall, I.M.S., C.M.Z.S.
1 Shark	Bombay market .	Mr. T. W. Cuffe.
1 Skate, juv.	Karachi	Mr. L. Bracht.
A number of Marine fish and invertebrates	Do.	Mr. E. Comber.
Specimens of wood bored by *Teredo* and *Pholas.*	New Docks, Bombay Port Trust,	Mr. L. H. Savile.
A small collection of *Hemiptera, Diptera Orthoptera* and *Coleoptera.*	Nasik and Karachi.	Mr. E. Comber.
1 Butterfly (*Parhestina mena*)	Naitwar	Col. T. Jermyn.
A collection of plants	Somali coast ...	Miss S. Swayne.

ALTERATIONS TO RULES.

ndry small alterations to the rules which were proposed by the Committee ccepted and agreed to.

INDIAN DUCKS AND THEIR ALLIES.

cretary mentioned that this book was expected to be published in bout the end of this month or early in June; so that subscribers their copies, he hoped, soon after that date.

PAPERS READ.

The following papers were then read :—

1. On the Ferns of the Bombay Presidency, by Rev. E. Blatter, S. J.
2. A branching Date Palm (*Phœnix sylvestris*) by F. Field.
3. Occurrence of the Crested Teal (*Eunetta falcata*) by L. C. Glascock.
4. Note on the Common Indian Crocodile (*Crocodilus palustris*) by P. E. Burn.
5. Abnormal tail in a lizard (*Hemidactylus gleadovii*) by G. A. D. Stuart I.C.S.
6. Severe effects from the sting of *Vespa orientalis* by Capt. MacWatters, M.B., I.M.S.

A vote of thanks to the authors of the papers terminated the meeting.

BALUCHISTAN NATURAL HISTORY SOCIETY.

PROCEEDINGS OF A MEETING OF THE MEMBERS HELD IN THE QUETTA MUSEUM AND LIBRARY BUILDING ON THURSDAY, THE 28TH NOVEMBER 1907.

Read letter, dated the 13th November 1907, from Major F. Wall, Dibrugarh, Assam, advising return of four snakes forwarded to him by Sir Henry McMahon for identification, and classifying them as—

1. *Vipera lebetina.*
2. *Zamenis diadema.*
3. *Zamenis mucosus* (young).
4. *Zamenis florulentus.*

The *Vipera lebetina* or Euphrates viper which had been found at Ziarat was then exhibited by Sir Henry McMahon, who remarked that it was a common snake in the hills round Ziarat, but almost unknown in India. It was one of the fauna of Baluchistan which illustrated how much more closely connected that fauna was with the Mediterranean than the Oriental fauna.

Resolved that the receipt of snakes be acknowledged.

Read letter, dated the 17th October 1907, from Colonel C. Swinhoe, London, advising the return, duly identified, of specimens of Baluchistan butterfli forwarded to him by Sir Henry McMahon, and intimating that one of th which had been classed by himself, Colonel Bingham and Heron, as a species belonging to quite a new genus, had been named "Lyela McMah after Sir Henry.

The Honorary Secretary also exhibited the butterflies in question.

Resolved that the thanks of the Society be communicated to Swinhoe for the trouble taken by him, and that the Museum Com asked (*a*) to send Colonel Swinhoe a further lot of butterflies, and to the Hon'ble the Agent to the Governor-General officially for 2 copies of Dr. Moore's work entitled " Lepidoptera Indica."

Read list of donations made to the Museum since the last meeting, Sir Henry remarking that the Smew included therein formed one of a large flock seen by his party on the Khushdil Khan Band.

Resolved that the list be recorded.

Sir Henry then exhibited a new pair of Markhor horns obtained on Takatu, and remarked that it appeared to be a cross between a Markhor and a domestic goat.

Major Goodwin, however, thought otherwise, and pointed out that the horns of domestic goats twisted inwardly, while those of the Markhor exhibited the opposite turn. He also exhibited a drawing of the horns of both Markhor and goat in support of his statement, which would tend to set at rest the point in doubt.

Major Goodwin further exhibited two pairs of Markhor horns which had been found by him interlocked on Zarghun ; also a photo of these horns taken by him at the time on the spot.

The animals, to whom they had belonged, had evidently got their horns interlocked while fighting, and had thus starved to death. The interesting point about these two pairs was the fact that each pair differed greatly in curve showing how the shape of Markhor horns varied even on the same hill.

Another pair of horns obtained on Takatu was exhibited by Sir Henry McMahon, who drew attention to the fact that it was of the Pir Panjal variety and not the Suleman variety.

PROCEEDINGS OF A MEETING HELD ON THURSDAY, THE 26TH MARCH 1908.

The Honorary Secretary placed before the meeting sixteen volumes of the Journal of the Bombay Natural History Society, which had been kindly presented by that Society to the Baluchistan Natural History Society. He also reported that he had acknowledged the receipt of the books, and had thanked the Bombay Natural History Society for their valuable gift.

The Honorary Secretary then placed before the meeting a long list of the Zoological specimens donated to the Quetta Museum since the last meeting, and reminded the members that April would afford them a good opportunity of securing specimens of birds not hitherto reported from Baluchistan, as many non-resident birds would then pass through the country on migration.

JOURNAL
OF THE
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Vol. XVIII. BOMBAY. No. 4

A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATES AND DIAGRAMS.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

Part VIII with Plate VIII and Diagram 1.

(Continued from page 554 of this Volume.)

The genus *Bungarus* as considered by Professor Boulenger in his Catalogue* includes but six species. Since the publication of this work he has added another to the list entitled *sindanus*, and I have added one to which I attached my own name.

I have for a long time tacitly dissented from Mr. Boulenger's views with regard to the forms he describes under the name *candidus*, believing that under that title at least three well marked species are included. To two of these he has conceded the minor rank of "variety" under the names *cæruleus* and *multicinctus*. Another very distinct form is that to which Evans and I applied the name *magnimaculatus*† and recorded as a variety of *cæruleus*.

Now all of these forms are very distinctive in colour and markings, are not connected by intermediate forms, inhabit very definite geographical areas, and show differences in lepidosis, so that I feel there is every justification for each being recognised as a distinct species.

My recent collections in Assam and Darjeeling have further revealed to me the occurrence of two distinct kinds of black krait which hitherto have been included under the title *lividus*.

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* Snakes in the British Museum, 1893 to 1896.

† Journal, Bombay Natural History Society, Vol. XIII., p. 611.

The total number of recognisable species now amounting to twelve, I think a brief review of the different forms is called for before discussing the common Indian form *cæruleus* with which this paper deals.

The easiest way to approach the subject is I feel by appending a table indicating at a glance the main points made use of in differentiation.

The key which follows is added to still further simplify the process of identification.

Some brief remarks on each of the species follow.

Name of species.	2 heads lengths behind head.	Midbody.	2 heads lengths before vent.	Vertebræ in midbody broader than long.	Ventrals.	Subcaudals.	Some subcaudals at end of tail divided.	2nd supralabial decidedly narrower than 3rd.	Body compressed.	Number of bands on body.	Number of bands on tail.	Habitat.
flaviceps ..	13	13	13	Yes	193-226	42-53	Yes	?	?	None.		Malay Archipelago and Peninsula, Cochin China and Tenasserim.
bungaroides ..	15	15	15	"	220-238	44-51	"	Yes	No	Many equidistant white lines. Belly white.		E. Himalayas, Khasi Hills, N. Cachar.
lividus	15	15	15	No	209-215	35-42	No	"	"	None.		The Brahmaputra Basin South of the Himalayas.
cæruleus ..	15	15	15	Yes	200-218	38-50	"	No	"	Many white lines in pairs.		Indus and Ganges Basins, Peninsular India and Ceylon.
ceylonicus ..	15	15	15	"	219-235	28-40	"	Yes	"	15 to 20 bands surrounding belly.	2 to 5	Ceylon.
fasciatus ..	15	15	15	"	200-234	23-39	"	"	"	16 to 27 complete yellow and black bands.	2 to 3	Brahmaputra Basin South of the Himalayas, Mahanadi Basin, Irrawaddy-Salween Basins.
magnimaculatus.	15	15	15	"	218-229	42-49	"	"	"	11 to 14 Bands not surrounding belly.	2 to 3	Irrawaddy Basin.
multicinctus ..	15	15	15	"	194-218	45-53	"	"	"	31 to 45 Bands not surrounding belly.	11 to 13	From S. China to the Irrawaddy-Salween Basins and Andamans.
niger	15	15	15	"	216-231	47-57	"	"	"	None.		Brahmaputra Basin South of the Himalayas.
candidus ..	15	15	15	"	210-222	40-50	"	?	"	20 to 25 Bands not surrounding belly.	7 to 9	Malay Peninsula and Archipelago.
sindanus ..	19	17 or 19	17	No	219-237	46-52	Yes	No	"	Many white lines in pairs.		Sind.
walli	17 or 19	17 or 19	17	Yes	192-207	48-55	No.	Yes	Yes	Many equidistant white banded lines.		Ganges Basin.

KEY TO THE KRAITS (Bungarus).

SCALES IN 13 ROWS IN MIDBODY .... *flaviceps.*

SCALES IN 15 ROWS IN MIDBODY.

- A. Shields at tip of tail divided .... *bungaroides.*
- B. Shields at tip of tail entire.
  - (a) Vertebrals narrow, longer than broad, not as broad as last row in midbody .... *lividus.*
  - (b) Vertebrals as broad or broader than long in midbody.
    - (a^1) 2nd supralabial as broad as 1st and 3rd .... *cœruleus.*
    - (b^1) 2nd supralabial decidedly narrower than 3rd and often than 1st also.
      - (a^2) Belly banded with black. Subcaudals 23 to 40.
        - (a^3) Tail tapering to a point. Banded with black and white. Peculiar to Ceylon .... *ceylonicus.*
        - (b^3) Tail blunt and fingerlike at end. Banded with yellow and black .... *fasciatus.*
      - (b^2) Belly not banded. Subcaudals 40 to 57.
        - (a^3) 11 to 14 streaked white bands on body, 2 to 3 on tail .... *magnimaculatus.*
        - (b^3) 20 to 25 pure white bands on body, 7 to 9 on tail .... *candidus.*
        - (c^3) 31 to 45 pure white bands on body, 11 to 13 on tail .... *multicinctus.*
        - (d^3) No bands. Back quite black .... *niger.*

SCALES IN 17 OR 19 ROWS IN MIDBODY.

- A. Vertebrals longer than broad in midbody. Ventrals 218 to 237. Peculiar to Sind .... *sindanus.*
- B. Vertebrals broader than long in midbody. Ventrals 192 to 207. Peculiar to the Basin of the Ganges .... *walli.*

Flaviceps (Reinhardt).—This is the only one of the group with 13 scale rows. It is really a Malayan snake extending into our Territory only in Tenasserim, which is a part of the Malayan Sub-region.

Bungaroides (Cantor).—This shares with *flaviceps* and *sindanus*, the peculiarity of having some of the terminal subcaudals divided. It differs from both in having 15 scale rows. It is a rare snake known only from the Eastern Himalayas in the vicinity of Darjeeling, the Khasi Hills in Assam and North Cachar.*

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* Annandale, Journ. As. Soc., Bengal, Vol. LXXIII., p. 210.

Lividus (Cantor).—This is peculiar in having the vertebrals but slightly enlarged. They are narrower than the last costal row, and longer than broad in the middle of the body. This peculiarity it shares with *sindanus* alone, but differs from that species in the scale rows being 15. It is quite black dorsally, not banded ventrally, and in these particulars like *niger* differing in the narrow vertebrals and in having fewer ventrals and subcaudals. There are four specimens in the British Museum which I have examined. Three are from Assam and one from India, precise locality not on record. I have lately received one from the Jalpaiguri District, two from Tindharia and one from near Tezpur, Assam, and examined another in the Museum of St. Joseph's College, Darjeeling, precise locality not known. The specimen from Saidpur recorded by Sclater[*] is probably of this species. All the localities from which it has been recorded are within the Basin of the Brahmaputra River.

Cæruleus (Schneider).—This is dealt with in the paper which follows.

Ceylonicus (Gunther).—This snake has alternate black and white bands which encircle the body and is peculiar to Ceylon.

Fasciatus (Schneider).—A very well marked form with black and yellow bands which completely encircle the body. The tail is peculiar in being blunt and fingerlike, and the back is ridged in a manner not seen in any other krait. It extends from South China and the Malay Sub-region through Tenasserim, to the Irrawaddy-Salween Basins, thence to the Brahmaputra Basin and the Eastern part of the Ganges Basin. (I have lately seen a skin from Bettiah, N.-W. Behar.) It is also common in a restricted area of the north-eastern part of Peninsula India, corresponding roughly to the Mahanadi Basin.[†]

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[*] J. A. S., Bengal, LX., p. 246.

[†] A single specimen in the British Museum labelled Anamallays and presented by Colonel Beddome is the solitary record of this snake from Peninsula India outside the area above specified. This record I discredit for the following reasons. A study of Boulenger's Catalogue and Sclater's list of snakes in the Indian Museum (Journal Asiatic Society of Bengal, Vol. LX) reveal the fact that no less than seven other species are recorded by Colonel Beddome alone from various parts of Southern India, all well-known inhabitants of other parts. These are *Tropidonotus himalayanus*, *T. subminiatus*, *T. parallelus*, *Lycodon jara*, *Simotes splendidus*, *S. octolineatus*, and *Dendrelaphis caudolineatus*. That Colonel Beddome received snakes from the Himalayas, Burma and Tenasserim, the localities from which these species are otherwise known, is certain, for there are specimens in the British Museum presented in his name from these areas, viz., *Simotes albocinctus*, *S. violaceus*, *S. cyclurus*, *S. cruentatus*, and *Dipsadomorphus hexagonatus*. It seems certain that all of the species above alluded to including a *B. fasciatus* were received from the localities just enumerated, and by an oversight mixed up with Colonel Beddome's S. Indian collections.

Magnimaculatus (Wall and Evans)*.—This form was first specially remarked upon by Evans and me who proposed the above name for it as a variety of *cæruleus*. Sclater had in 1891 made allusion to two specimens in the Indian Museum which I have now examined. I saw no specimen in the British Museum when I examined the kraits there some five years ago. There are 11 to 14 broad streaked bands on the body and 2 to 3 on the tail. These are white with black streaks in the length of the snake. The black intervals are rounded off near the ventrals, so do not embrace the belly. I have seen 5 specimens.

It is only known from a limited area in the Irrawaddy Basin, Meiktila and Monywa (Wall and Evans), Meiktila (Sclater), and Colonel G. H. Evans has written to me that he has met with it in Hmawbi, Myingyan, and the Shwebo District.

Multicinctus (Blyth).—This considered by Boulenger but a variety of *candidus* differs by its very distinct colouration, and its habitat. It has from 31 to 45 pure white bands over the back on the body, and 11 to 13 on the tail. The black intervals do not surround the belly. It appears to be uncommon in the whole of the area it inhabits which ranges from Southern China to the Irrawaddy-Salween Basins†. Within our limits it is known from Insein and Rangoon (Wall and Evans), Toungoo (Boulenger), and an example in the Indian Museum is from the Andamans. Fig. 4 of our Plate is from an excellent example. I have examined 10 specimens.

Candidus (Linne).—This is the form originally described by Linné, from Java. It is black with from 20 to 25 broad light bands on the body, and 7 to 9 on the tail. These bands may be pure white as shown in figure 7 of our Plate, or may be more or less subdivided by a mottling of black. It is only known from the Malay Peninsula and Archipelago.

Niger (Wall).—This has been confused until now with *lividus*, from which it differs in having the vertebral row of scales broad (broader than long in midbody) and a greater number of ventrals and subcaudals. It appears also to grow to a larger size, my largest specimen being 4 feet and half an inch, whereas I do not know of a specimen of *lividus* exceeding 3 feet 2 inches. I have had within the last year 7 specimens from Dibrugarh and Sadiya (Assam), and more recently eight from Tindharia and Pashok, 1,000 to 4,500 ft. (Eastern Himalayas). Sclater (Journal, Asiatic Soc. of Bengal, Vol. LX., p. 246) under the title *lividus* mentions three specimens in the Indian Museum from Sibsagar and the Garo Hills (Assam), and Saidpur in the Dinajpore District. The latter I could not find, but the two Assam specimens are *niger*. I have seen 16 examples.

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* Bombay Natural History Journal, Vol. XIII., p. 611.

† I think the locality of one given as Purneah in the Indian Museum, *viz.*, No. 13788 (or 9?), calls for confirmation.

Sindanus (Boulenger).—Until 1897 the only specimen known had been regarded by Professor Boulenger as an aberrant *cœruleus*. It differs however in having the costals in 17 or 19 rows in midbody, the vertebral row of scales longer than broad in midbody, and in having a larger number of ventrals. It is also peculiar to Sind. The specimen recorded by Annandale as such from Midnapore* is the next species.

Walli (Wall).—This very distinct form agrees with the last in the possession of from 17 to 19 scale rows in midbody but differs in having far fewer ventrals, the vertebral row of scales broader than long, the subcaudals entire throughout, the 2nd supralabial markedly narrower than the 3rd, and usually than the 1st also, a markedly compressed body, and in colouration and habitat. There are many white, equidistant arches across the back, composed of ovate white spots which have no tendency to be arranged in pairs. The tail is more or less mottled beneath especially towards the tip. It is only known from the Ganges Valley. I obtained 8 specimens in Fyzabad and have seen two more in the St. Joseph's College Museum, Darjeeling, which formed part of the collection of the late Dr. Vincent Richards; the locality not known but probably Bengal, also four others in the Indian Museum from Purneah and Midnapore.

THE COMMON KRAIT (*Bungarus cœruleus*).†

Nomenclature.—(*a*) *Scientific.*—Bungarus was applied originally by Daudin in 1803 and is derived from "bungarum pamah," a vernacular name applied according to Russell‡ to the banded Krait (*Bungarus fasciatus*) in Bengal.

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* J. A. S., Bengal, 1905, p. 213.

† My conception of this as a species is based upon an examination of well over 200 specimens.

‡ Ind. Serp., 1796, Vol. 1, p. 3.

The specific name *cæruleus* (Latin, meaning blue) was given by Schneider[*] in 1801 to this form. (Figure 5 of our plate.)

(*b*) *English.*—The Krait, or common krait, is borrowed from the vernacular name for this snake in certain parts of Northern India.

(*c*) *Vernacular.*—The plethora of native names shows that the snake is abundant, and well known everywhere. Some names appear very local. It is probable there has been confusion between this and other snakes as one must expect with natives especially.

Nicholson[†] says it is called "Anali" about Madras, a word, he says, implies "ringed" or "decorated" in Tamil and kindred languages, and is somewhat loosely applied.

I have known it called "kattu viriyan" about Trichinopoly, the Tamil for "banded viper." Father Bertrand also writes me it is known under this name in S. India, as also is *Lycodon aulicus*; "viriyan" too, he remarks, though meaning "viper," is applied to many non-poisonous snakes.

Jerdon[‡] says it is the "yenna vyrien" of the Tamils: "yenna" is the Tamil for "oil," and must refer to the oily polished surfaces of the scales. I have also known it called "kutti pisarshi" "bad devil," and "panna viriyan" or "palmyra viper" in South India.

In Mysore Rice[§] gives the Canarese name for it as "godi nagara" which appears to me very doubtful from the English interpretation "wheat cobra."

In Cannanore it was called "valla pamboo" which is Malayalam signifying "bangle snake."

Colonel Dawson tells me that in Travancore it is known as "yettadi veeren" (Malayalam) and "yettadi virien" (Tamil), "yettadi" means "eight feet" and implies that the snake is so venomous its victim dies within eight paces; "veeran" and "virien" he suggests may be derived from the Tamil "visham" "poison."

Russell[¶] says the Tamils call it "karu walalay": "karu" is the Tamil for "black," and "walalay" I am told means "polished."[‖] Again he says the snake he figures on Plate XXI in his second

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[*] Hist. Amph. II, p. 284.

[†] Ind. Snakes, pp. 133 and 134.

[‡] Jourl., Asia. Soc., Bengal, Vol. XXII., p. 522.

[§] Mysore, Vol. I, p. 188.

[¶] Loc. cit., Vol. II., p. 36.

[‖] I am indebted to Dr. J. R. Henderson of Madras for many of the translations of vernacular names in use in S. India.

Volume (clearly a krait though peculiar in colouration) is called "Seu walaley." "Seu" or "Sew" means "brown." The same authority* says this snake is called "gedi paragoodoo" further north about Vizagapatam. Mr. J. M. Turing, Deputy Commissioner at Vizagapatam, to whom I lately appealed for information, says the words are Telugu, "gaddi" meaning "grass," and "parugudu" a "runner." He suggests that this is the same snake known about there as "tutte purugu," the Telugu for "rubbish reptile." Russell's other name for this species in this locality, *viz.*, "pakta poola" he can throw no light on.

I have frequently heard it called "krait" or "karait" by natives but am not sure whence these names emanate. Sampwallahs journey far from their own homes, and coolies and some of one's household servants too, and many will consequently make use of these names in a locality where they may not be known. Kullan, the snake catcher, I knew in Delhi always called this species "krait," but Major McMahon† says "krait is I presume merely an English corruption of the Urdu word kalgundait. If not it must be a Bengali corruption of it, as no native of Delhi would understand you if you spoke of the karait or krait." I have had "kálgundait" given me by a native of Karnal in the Punjab for the *Zamenis diadema*, but there seems little doubt it is the Urdu name for the krait. I find Baboo Awmoola Ruttum Bysach in his work on medicine written in Urdu gives the name for this krait which he mentions by its scientific name *cæruleus* and describes, as "kala gandait." He says the "kala" means black, and that "gandait" refers to the white lines across it. I cannot however find confirmatory evidence of such a word in Urdu. He also gives as one of its names "dhaman chitti," "chitti" I find means speckled or variegated. These names "chitti" and "dhomum" or "dhomna chitti" are also mentioned by Fayrer‡ and Ewart§ as being used in Bengal. It must be noted that "chittee" is the name applied according to Russell to a very different snake in Bengal, *viz.*, *Helicops schistosus*.¶ A European subordinate who had been many years in the Kheri District (U. P.) and knowledgeable in discriminating snakes told me that it is known locally there as "goohooan."

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* Loc. cit., Vol. I., p. 2.

† Fayrer's Thanatoph. Ind., p. 11.

‡ Loc. cit., p. 122.

§ Ind. and Australn. Snake Poisoning, 1874, p. LXXVII.

¶ Loc. cit II., plate IV.

Colour and marks.—In this form there are closely set white linear arches thrown across the back, arranged more or less distinctly in pairs. These are much more perfect and conspicuous in the posterior part of the body, and tail. At midbody or further forward they gradually fade especially laterally, and may become replaced more anteriorly by white vertebral spots, or may even completely disappear. The black on the back is lustrous, and if the light be allowed to glance on it appears even bluish, hence the name *cæruleus.* The top of the head is black, fading to white on the lips. The belly is white like mother of pearl in its entire length including the tail to its extreme tip. The young of *cæruleus* show more white. Not only are the arches posteriorly more conspicuous than in adults but they are often unusually apparent in the anterior half of the snake, and there is often a partial or complete white collar, and some white on the top of the head. Two white bands too pass upwards from the 2nd and 5th supralabials, the former in front of, and the latter behind the eye.

In adults specimens occur in which the black is tinged more or less deeply with brown, and I have seen one specimen from Fyzabad in which the black had a metallic lustre, resembling that of black lead on a grate compared with the purer black on a polished boot.

Russell* figures a curious specimen from Tranquebar, in which the body is dark-brown, the anterior six or eight inches uniform buff, and the linear arches bluish. It suggests to me the possibility of having been preserved in some chemical, or that the specimen was an old spirit one. I have in many small collections and museums seen specimens in which the spirit had been allowed to evaporate, and the specimens kept in a strong light. In such a case the black of the krait fades to brown, and where left dry as often happens when the head is suspended to the cork or stopper the colour fades to a tint very like that shown in this illustration. Quite light specimens are occasionally heard of which may be regarded as albinos. One such is in our Society's collection, and Mr. Phipson drew my attention to it in 1904 when I was in Bombay.

It must be emphasized, however, that though the ground colour is occasionally modified, the number, disposition, and character of the white arches remain distinctive.

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* Loc. cit., Vol. II, plate XXXI.

About the form depicted in figure 6 of our Plate I am very uncertain. The double white bands suggest that it may be merely a variety of the last form though I cannot think so. I am very familiar with typical *cæruleus* from many parts of India, and have always found it the same, with no suggestion of forms intermediate between those shown in figures 5 and 6 of our Plate.

I speak with doubt but my impression is that No. 6 is a form peculiar to Bengal. I am not aware that I have seen it except in the Zoological Gardens in Calcutta where it is usually, if my recollection serves me, represented by several specimens. This recollection makes me incline to the belief that it may be a local form. I trust some of our members may assist in clearing up any doubts as to its distribution and relationship with the last.

Distribution.—I have seen examples from Ceylon*, Trichinopoly, Cannanore, Bangalore, Madras, Berhampore (Ganjam), Bilaspur, and Saugor (C.P.), Sitapur, Fyzabad, Gonda, Agra, Delhi, Godda (Behar), Umballa, Bannu and Sind.† All of these specimens are alike in possessing paired linear arches. Figure 5 of our Plate shows these arches rather too stiff and conventional, but the figure otherwise is good.

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* Spol. Zeylan., Vol. IV, Part XVI, p. 174.

† The only observer who has recorded this form East of Calcutta is Cantor, who referred to it from the Malay Peninsula, and sent five specimens from this locality to the British Museum. I think I can show good grounds for doubting the accuracy of these records. It is to be noted that the same authority stands alone in recording at least six other well known Indian species from the Malay Peninsula, all otherwise not recorded outside Indian limits. These species are *Typhlops bothriorhynchus*, *Polyodontophis sagittarius*, *Xenochrophis cerasogaster*, *Helicops schistosus*, *Zamenis fasciolatus*, and *Hypsirhina sieboldii*. (Vide Cat. Snakes Brit. Mus., 1893 to 1896, *Vol.* I, pp. 23, 188, 191, 274, 405, and Vol. III, p. 12). It will be noticed that all of these species are to be met with in Western Bengal, where indeed many are common. Now it is certain that Cantor received snakes from Bengal among other parts of India, for there are specimens in the British Museum presented by him and labelled from Bengal. These include *Polyodontophis sagittarius*, *Xenochrophis cerasogaster*, *Lycodon jara*, and *Hypsirhina enhydris*. (Vide Cat. Vol. III, p. 598, Vol. I, p. 191, Vol. III, pp. 618 and 7.)

From these facts it is difficult to escape the conviction that all the five specimens of *cæruleus* sent by Cantor to the British Museum (labelled, Penang) were received with the other snakes just enumerated from Bengal, and inadvertently mixed with his own local collections.

Dimensions.—The krait grows to 4½ feet. I have measured the skin of one from Bannu 4 feet 6½ inches, and seen half a dozen others over 4 feet, but specimens of this size are rare. Murray* gives the length as 5 feet, but of this I have doubts. I think he probably referred to the Sind krait (*B. sindanus*), a larger form which was confused with *cæruleus* for some years, and only recognised as a distinct species by Boulenger in 1897.†

It would appear that this snake in common with many other attains a greater length in the North than in the South. The only specimens over four feet in length I have seen were in Orissa, in Fyzabad, and on the North-West Frontier. Colonel Dawson, who reports the krait a very common snake about Trivandrum, says the largest record there he is aware of was 3 feet 4 inches. The largest specimen known to Dr. J. R. Henderson in Madras was 3 feet 8 inches. Again a hatchling I obtained in Cannanore was 10¾ inches, whilst specimens from Fyzabad varied from 11½ to 11¾ inches.

Physiognomy, bodily configuration, etc.—One noticeable feature, which some of our vernacular names show has not escaped observation, is the highly polished and glistening character of the scales. The black in which some see a bluish tinge is thus lustrous like a highly polished boot, and the white almost enamel-like. The head is less flattened than in many snakes, the snout rounded, and the neck but little evident.

The eye is peculiar in that the iris is not coloured, and as a result the shape of the pupil, which is round, cannot be discerned in life. The organ as a whole looks like a jet bead, and in this respect the snakes of this genus are nearly unique among the Colubridæ. The Lycodons alone, as far as I am aware, share this peculiarity. Figure 1 of our Plate does not clearly illustrate this. The nostril is rather large, occupying the full depth of the suture between the nasal shields. The tongue is pinkish and in having white tips presents a peculiarity I can only recall having seen in *Dipsadomorphus trigonatus*. The body is round, and of very even girth in its whole length. The tail tapers evenly and rapidly, and is short, being about one-eighth to one-ninth the total length of the snake.

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* Rept. of Sind, p. 55.

† Bomb. N. H. Journ., Vol. XI, p. 73.

Breeding.—The krait is known to be oviparous. The exact mating season I have not been able to ascertain with certainty, but it is probably during the months of February and March.

Period of gestation.—This is not known.

Incubation.—The female, after discharging her eggs, remains coiled up with them, at any rate until they are well advanced towards incubation. In the case reported in this Journal by Bannerman* the eggs which were found with the mother contained embryos "about six inches long." In another instance eggs unearthed with the mother in Bannu and sent to me were found to contain young embryos.

Eggs.—Specimens from two clutches that I have examined struck me as being unusually large for the size of the snake. The measurements in each case were the same, *viz.*, 1⅜ inches in length and ¾ inch in breadth. When freshly discovered they were reported "like pigeon's eggs and plump." They were white, the poles equally rounded, the shape elongate, and the shell soft, yielding, and of a leathery texture.

This species is not very prolific as snakes go. In the gravid female reported by Blanford † from Bilaspur there were 9 eggs. With the specimen reported by Bannerman only 6 eggs were found. In one clutch sent me from Bannu last year there were 10.

Season of deposition.—The eggs are deposited probably in April and May in holes in the ground a foot or two from the surface. Two clutches were found in June last year at Bannu when removing the old stophutt. In Bannerman's example they were unearthed at Parel on the 24th May.

Period of incubation.—This is not known.

Embryos.—The embryos hatch out in May, June and July and measure about 10½ to 11¾ inches as they emerge from the egg. One in Cannanore measured 10½ inches in June, and four in Fyzabad varied from 11½ to 11¾ inches in June and July. From this it would appear that specimens in the South run smaller than those in the North of India. They grow nearly a foot in the first year of life, and a foot or more in the second and third years as may be judged from the annexed table.

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* Vol. XVI, p. 743.

† Jourl. Asiat. Soc., Bengal, Vol. XXXIX, p. 374.

The sexes.—The sexes are of similar length when hatched, and remain so apparently till the fourth year. In the fifth year, if one is justified in judging from such meagre figures as appear in the attached table, the males appear to outstrip the females, as the four specimens over four feet in length in which I have recorded the sex were all males.

The longest females I have records of were 3 feet 6 inches, 3 feet 6½ inches, and 3 feet 7¾ inches, all from Fyzabad.

Males appear to be more numerous than females, for of 67 specimens in my notebook where sex is recorded 40 were males.

Maturity.—Judging from the table appended, the gravid female reported by Blanford in Bilaspur as 2 feet 11 inches long in June, must have been beginning her third year of life.

Anal glands.—The anal or scent glands secrete a blackish material of the consistency of a soft ointment. This has a peculiar, rather disagreeable, but not very penetrating, odour. The glands in both sexes are active at all seasons, and at all ages from the time of hatching, so that I am inclined to question the popular belief fostered by Darwin * among others that they are concerned with the sexual functions.

The following table gives the growth of the krait as shown by my records extending over several years. The specimens have been collected in various parts of Peninsular India, North and South. July and August are selected as the months furnishing the largest material.

July.				August.			
Number.	Sex.	Range of lengths.	Average length.	Number.	Sex.	Range of lengths.	Average length.
3	♂	1′ 1″ to 1′ 2⅛″ ...	1′ 1¾″				
5	♀	11¾″ to 1′ 1¾″ ...	1′ 0⅝″				
3	♂	1′ 8¾″ to 1′ 11⅛″ ...	1′ 10⅛″				
4	♀	1′ 11⅛″ to 2′ 3⅜″ ...	2′ 0⅛″	3	♀	1′ 5¼″ to 1′ 11¾″ ...	1′ 8″

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* Descent of Man, p. 589.

July.				August.			
Number.	Sex.	Range of length.	Average length.	Number.	Sex.	Range of length.	Average length.
3	♂	3′ 0½″ to 3′ 3¼″ ...	3′ 2″	3	♂	2′ 6″ to 2′ 8¼″ ...	2′ 7½″
3	♀	2′ 11⅜″ to 3′ 1¾″ ...	3′ 0⅜″	3	♀	2′ 6″ to 2′ 10¾″ ...	2′ 8⅜″
2	♂	3′ 7¼″ to 3′ 9½″ ...	3′ 8¾″	4	♂	3′ 5″ to 3′ 7″ ...	3′ 6½″
2	♀	3′ 6″ to 3′ 6½″ ...	3′ 6¼″	1	♀	3′ 7¾″	3′ 7¾″
2	♂	4′ 0⅛″ to 4′ 1¼″ ...	4′ 0⅝″	2	♂	4′ 0″ to 4′ 4¾″ ...	4′ 2⅜″

Identification.—It is a matter of surprise to me and worthy of special remark how very few of the European population in this country are able to identify the krait in spite of its wide distribution, numerical strength, its extremely deadly nature, and the fact that it possesses exceptionally distinctive and easily recognisable characters. With the exception of a very few medical officers, and a still smaller number of naturalists, I have scarcely met a soul who has any idea what the krait looks like, with the result that I get almost every variety of common harmless snakes sent in to me as such. It is difficult to account for such lack of interest in a country where poisonous snakes abound. The popular idea is that the krait is a small snake which haunts our habitations, and any small snake has merely to enter a house to be set down forthwith as a krait. The first essential in diagnosis is the enlargement of the vertebral row of scales. This peculiarity is found in only a few other snakes besides the genus *Bungarus* notably the genera *Dipsadomorphus*, *Dendrophis*, and *Dendrelaphis*, some species of *Amblycephalus*, *Xenelaphis hexagonotus* and *Elachistodon westermanni*. The second point to look for concerns the shields under the base of the tail (subcaudals). These shields in most snakes are divided by oblique sutures into pairs, but in most kraits they resemble the shields beneath the belly in that they pass right across the tail. These two points taken together are sufficient to declare the snake a krait. 11 of the 12 known species can be thus distinguished.* So it only remains to separate the species under discussion from its closely allied forms. Attention must be paid to the following points:—(1) The costals are arranged in 15 rows. This excludes *flaviceps*, *sindanus* and *walli*. *Cœruleus* is the only one of the remaining species in which the 2nd supralabial is as broad as the 3rd. The number and character of the white arches is distinctive, and its distribution will assist where any doubt may arise.

It is to be noted that it is the only krait inhabiting the Indian Peninsula South of the Ganges if we exclude *fasciatus* which occurs in the basin of the Mahanadi only. In Sind it is associated with *sindanus* and north of the Ganges with *walli*.

It does not occur in the Brahmaputra Basin where it is replaced by *bungaroides*, *lividus* and *niger*.

In Ceylon it is associated with *ceylonicus*.

It does not occur in Burmah but is replaced by *magnimaculatus* and *multicinctus*.

There should be no difficulty in recognising any snake as a krait, however mangled the specimen may be.

Several snakes bear some superficial resemblance to the krait, and these we are figuring in our next two Plates. I reserve comment upon the resemblances, and the further characters to be relied upon in distinguishing between them, till discussing each form separately, but it is to be noted that none of them share either of the peculiarities affecting the vertebral row of scales, and the subcaudals given above as characteristic of the kraits.

Disposition.—The krait is one of the most inoffensive snakes I know. I have had numerous living examples brought to me, and have kept several in captivity, so that my opportunities for studying its nature have been abundant.

Time after time I have recorded the singular timidity of this snake in my notebooks, often under the greatest provocation, and only once have I seen one bite at anything in anger. This specimen had been impaled through and through by a trident and could only move a few inches of its body behind the head. It must have bee enduring the most fearful torture but even in this predicamen though alert and lively, moving its head and quivering its tongue it refused to bite things thrust at, or held up to it. In trying t remove it from the rusty prongs that pierced its body, it endured the suffering for some time, but finally buried its teeth into a mass of fat that had escaped from its wounds. When freed it did not repeat the act, or betray any further vice. I noticed that two specimens I had caged together used periodically to grasp one another's bodies in their jaws, one shifting its grasp down the length of the other, as though seeking a favourable spot to commence devouring its mate.

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* In one rare species inhabiting the Eastern Himalayas and Assam Hills, *viz.*, *bungaroides*, some specimens have all the subcaudal shields divided, so that the diagnosis here given for *cœruleus* though holding good for nearly all the kraits, breaks down as an absolute generic test. I have therefore in a previous paper (Vol. XVII, pp. 57-68) had recourse to additional points when dealing with the kraits as a group.

Many specimens I played with or teased, simply hid the head beneath coils, and refused to move. Some I noticed flattened the hinder part of the body and inflated and deflated themselves anteriorly like many other snakes under excitement, and it is remarkable how expansive the lung must be, for in one specimen, in which marked inflation was noticeable from the 3rd to the 18th twin white arches, it was found upon subsequent dissection that the lung only reached as far back as the 7th twin arches. It very frequently emits the tongue in a leisurely fashion when provoked. Its placid disposition banishes all fear, and tempts one to disregard any precautions in handling it, at least this is my experience.

I noticed especially in Delhi years ago that Kallan the most intrepid snakecatcher I have ever seen, who collected scores of poisonous snakes every week, treated the krait with supreme indifference, though he exercised the greatest caution in dealing with *Echides.*

Fayrer* says: "In my experience I had always the greatest difficulty to get the cobra, krait, and daboia to bite voluntarily." Nicholson† calls it a "very inoffensive" snake. Gleadow‡ says "I have always found it quiet, and not pugnacious." Millard‡ remarks that it is "very shy." Colonel Dawson ‡ says, "It is a very shy snake, and rarely bites except in self-defence or when hurt." This is fully exemplified by the behaviour of the snake which caused the fatality, in the case of the keeper reported herein. The krait was unearthed while the man was digging. He picked it up, and tied a piece of cloth round its head, which the snake got rid of several times on the road from his house to Trivandrum Gardens. Arrived at the gardens the snake again freed its head, and it was whilst trying to bind it on again that the bite was inflicted. Dr. J. R. Henderson writes to me: "I have frequently kept this species living but could make little of it, except that it appeared sluggish, and not easily irritated."

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* Loc. cit., p. 64.

† Ind., Snakes, p. 147.

‡ In Epistola.

The behaviour of a specimen placed by Russell with a cobra bears out the above opinions. He says, "The next subject opposed to the cobra, was a Gedi Paragoodoo" (common krait) "which, in all its movements, was much tamer than either of the former two" (*i.e.*, *Zamenis fasciolatus* and *Vipera russellii*), "and seemed solely intent on escaping out of the room, or retreating into a dark corner. When pushed roughly on the cobra, and consequently struck by him, he made no resistance, nor snapped in return: he did not even offer to retreat, but laid himself close to the cobra, whose body he often touched in his convolutions, without any apparent offence being taken." Colonel Dawson tells me that at Trevandrum when given a pot of sand or earth he has seen them trying to bury themselves.

Food.—This species, like others of this genus, is in the main ophiophagous in habit, but in a state of nature as well as in captivity will partake of most other things offered. I have on eight occasions found snakes eaten, once *Bungarus walli* and once *Lycodon aulicus* and on the other occasions *Typhlops braminus*. In every case where young examples had fed *Typhlops* had been taken. Mr. Millard tells me that "those kept in the Society's Rooms refused all food but snakes." Dr. J. R. Henderson tells me, "I have frequently given a captured specimen a living snake to eat, and in most cases the latter was inside the krait by next morning. On one occasion one disposed of a *Dryophis* longer than itself." Father Dreckmann writes to me, "their food, as far as I can judge, consists exclusively of other snakes. I have never found anything else in their stomachs, and a very fine specimen disgorged three other snakes in different stages of digestion during the first night of its captivity." There are at least 7 other records reported in this Journal where other snakes had been devoured.

On the other hand I have twice known frogs eaten, and Fayrer* records a similar experience. In the Administration Report of the Madras Museum, 1896 to 1897, one specimen is reported to have eaten 2 frogs, and another 18 frogs during incarceration. I have twice found toads (*Bufo andersonii*) in the stomach, and once a monitor lizard (*Varanus flavescens*). Small mammals too are occasionally devoured. I once found a muskrat (*Crocidura cœruleus*) in gastro, and Assistant Surgeon Robertson told me he found 5 young muskrats taken on one occasion. I have twice seen a brood of young mice which had been swallowed, and in Bannerman's escaped specimen, when ultimately recovered, the meal consisted of 6 newly born rats. Captain Liston, I.M.S., tells me that at Parel they have lately found that both kraits and Russell's vipers readily eat the young fœtus from rats in an advanced state of pregnancy.

Sloughing.—The krait casts its skin probably every month. One in captivity in the Madras Museum, captured on the 7th November 1896, sloughed on the 7th December 1896, the 13th January, and 27th February 1897.†

Haunts.—Fayrer says, "It is found in the fields, grassy plains, rice khets, low scrubby jungle, and among debris of wood and buildings. It sometimes insinuates itself into houses, in the verandah, bathrooms, on the ledges of doors or jhilmils, into book cases, cupboards, etc." Millard writes to me, "It is very fond of living in the roofs of bungalows." Theobold‡ speaking of kraits as a group says, "They delight in water and its vicinity," an observation which receives support among others from Father Castels, S.J., who writes to me that in Trichinopoly "small specimens have been brought to me in bundles of 20 or more caught, as they said, in water." I have had several specimens brought to me that were captured in water. These were, I think, always captured in the hot weather, which seems to show that they grow very thirsty and for this reason they frequently get into places from which they cannot extricate themselves, such as wells, and the little pukka tanks connected with the irrigation arrangements so commonly seen in Indian Gardens.

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* Loc. cit., p. 121.

† Administration Report, 1896 to 1897.

‡ Journl. Asiatic Soc. Bengal, 1868, p. IV.

They appear to me to be commonest in the precincts of man, and to actually domicile themselves in human habitations for choice. Thus the krait may usually be reckoned as one of the commonest snakes to be found about cantonments and even in the bazaars, and its numerical. strength is probably little dreamt of by even the most nervous residents. In Fyzabad for instance I obtained 47 specimens in June, July, and August 1906, all caught or killed in cantonments. Judging from the weekly bags brought in by the snake-catcher Kallan at Delhi it was probably as common in that station. A very large number of my specimens were encountered inside bungalows, outhouses, bazaars and about jails. As a rule they have been found on the ground, or floors, far less commonly in the roofs, or situations necessitating clambering efforts. It appears to be decidedly nocturnal in habit, most of my specimens have been killed at night. Mr. Millard mentions in a letter to me that in captivity it likes to get away from the light, and Colonel Dawson informs me that "in captivity they never move as a rule during the day time but become very active about dusk."

Poison.—Authentic records of krait bite are rare although the species is so abundant in man's immediate environment. This is partly due no doubt to the inoffensive nature of the snake already remarked upon, but must also be largely attributed to the incompetency of many medical men to recognise it. There can be no doubt, from what is known of the virulence of krait venom, that a fatal issue usually attends the bite of this snake.

Fayrer* quotes the remarkable homicidal case originally reported by Chevers where four credulous men allowed themselves to be bitten by a krait about three feet long under the assurance that no evil effects would follow. They were bitten one after another at night, the sampwallahs goading the snake to fulfil their purpose by administering blows with a cane. The first man bitten died before dawn, having complained of thirst and foamed at the mouth. The second and third died about noon the next day, and the fourth recovered after suffering from giddiness, perspiration, pain in the stomach and unconsciousness. Fayrer† reports another case where a chowkidar died six hours after having been bitten in the forefinger. He suffered burning pain locally, later in the head, and then in the whole body. He grew weak till he could hardly articulate and a drowsiness supervened which culminated in death. A third case recorded by Fayrer died three hours after a bite in the finger. Here again great pain was experienced locally, and swelling. His respiration became short and hurried, he complained of constriction round the chest, became increasingly drowsy till death. Elliot records the death of a sepoy thirty-one hours after being bitten on the ankle. No symptoms were recorded. He was treated with ligature, and incision, and 1⅕ grains of strychnia were administered hypodermically.

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* Loc. cit., p. 51. † p. 54.

Another case was recorded in the *Indian Medical Gazette* of February 1874. The subject, a Hindu male, aged about 60, was bitten in the left index finger, at 9 p.m. one evening. At 5 a.m. the next morning he was admitted into hospital with giddiness, drowsiness, incoherent speech, difficult breathing and a choking sensation in the throat. He could not walk or sit up unsupported. The hand was livid, swollen, and painful. An hour later his parotid glands were noticed swollen, he vomited, and had severe shooting pain in the left thigh. Later vomiting was repeated, breathing became more oppressed, and he became very restless. At 7 a.m. he was unable to speak or swallow, his eyelids had drooped, and he was constantly putting his hand into the mouth as though to attempt to remove some obstacle. His leg muscles twitched. The symptoms increased, and he died at 9 a.m. in convulsions. He was treated with six intravenous injections of liquor ammonia, amounting in all to three drachms.

I am indebted to Colonel F. W. Dawson for the following :—A keeper in the Trivandrum Museum was bitten on the right index finger by a small krait, one and-a-half feet long, at about 1-30 p.m., 13th August 1907. The bite felt like a pinprick, there was no bleeding, and indeed no mark whatever of a puncture. He went home having declined all persuasions to go to hospital, and apparently stayed in his house till about 3 p.m., when he began to feel a burning pain in the bitten finger. He walked to a hakim's house without any difficulty, and soon after arriving suffered intense pain in the abdomen. At 5-30 his neck became rigid so that he could not turn his head, and his body became rigid so that he could not stoop. He was unable to talk. His respirations became laborious and coma set in. Frothy matter, and a quantity of phlegm-like mucous passed with great difficulty from the mouth and nostrils. Towards the climax he had two convulsive seizures, and he died apparently from suffocation at about 7 p.m. the same day. It was observed that the heart pulsated some time after breathing had ceased. Further Colonel Dawson says, "There have been several cases of death from bites of the krait here lately, in all of which the prominent symptoms were burning pain of the bitten part, rigidity of the neck and pain in the abdomen." He was informed by his head-keeper that a neighbour's boy of 6 or 7 years of age had awaked one morning recently with an intense pain in the abdomen. He was treated in hospital for stomach-ache, and sent home. On moving the mat on which the child had slept a krait was discovered. A train of symptoms very similar to those experienced by the keeper who died followed, and the child died. No mark of a puncture could be found on the body.

Lieut-Colonel Dimmock, I.M.S., has kindly communicated the following interesting case : A Hindu male, aged 35, was bitten on the dorsum of the right foot at 11·p.m. on the 29th November 1907 by a small krait "about two feet long" identified as such at the Parel Laboratory. At the Railway Hospital, Bombay, two punctures half an inch apart at the seat of the reported bite were slightly incised, and permanganate of potash applied. He was transferred to the Jamsetjee Jejeebhoy Hospital where the punctures were freely incised, and permanganate crystals rubbed in. On admission he was reported as "suffering from fright, pretended to be insensible but is quite conscious." . . "In the night his pulse became slow and feeble, and respirations shallow, and hurried. Next morning he was quite well and went home at noon." Internally he was treated with ammonia, and hypodermically with strychnia. The dose of poison injected may have been small, but whatever the dose it certainly appears as if the permanganate had very completely neutralised its action as no symptoms occurred other than those directly referable to fright. Ammonia and strychnia have both been proved powerless agents in snake bite, though, of course, they are powerful restoratives in

Poison apparatus. Fangs.—These structures are relatively small when contrasted with those of vipers, and even perhaps with that of the cobra. In a well grown adult I have measured the fangs one-eighth of an inch along the straight, and I think in the largest specimens they will be found scarcely to exceed this length. They are canaliculate with a very obvious seam on the anterior face where the circumflexed margins of the walls forming the canal meet. Often two fully operative fangs occur side by side in the same jaw. Behind these the maxilla is hollowed to receive the sac in which the reserve fangs develop, and behind this again it gives origin to four small teeth, which are grooved though in no way connected with the poison apparatus.

Glands.—These structures, as far as I can judge, are relatively about as well developed as in the cobra. They are smooth, somewhat retort-shaped, and when cut into reveal a cancellous structure similar to the appearance of a sponge.

Poison. Physical properties.—I have rarely seen the poison "in vitro" either in the liquid or dried state, and can find no special references to its re-action, taste, and appearances, etc. To the naked eye it appears, when fluid, much like cobra venom, a clear fluid, with the consistency and colour of pale salad oil.

Quantity.—I have no records of the yield of a single gland nor can I find any in literature, but the yield is, I think, very considerably less than that of a cobra of the same size.

Poison.	Subject.	Minimal lethal dose per kilogram weight in milligrammes.	Authority.	Reference.
Krait ...	**Pigeon ...**	**·25**	**Rogers... ...**	**Phil. trans. Royal Soc. London, 1904, Series B., Vol. 197, pp. 137 and 147.**
Cobra ...	**" ...**	**·4 to ·5**	**" ... ...**	
Krait ...	**Rat ...**	**1·00**	**Elliot, Sillar and Carmichael.**	**Loc. cit. p. 327.**
Cobra ...	**" ...**	**·04 to ·07**	**Lamb ... ...**	**Scient. Mem. Officers Med and Sanitary Department. No. 7, p. 19.**
" ...	**White rat...**	**·25**	**Fraser ... ...**	**Nature, 16th April 1896.**

Toxicity.—As will be seen from the annexed table it is impossible from the present available research work to draw a comparison between the relative virulences of krait and cobra venoms. The investigators quoted are all men of the greatest ability, their work when critically studied is convincingly careful and precise, and yet their results vary enormously. Rogers makes it appear that krait venom is about twice as deadly as cobra venom. Fraser's results compared with Elliot, Sillar and Carmichael's show that cobra venom is four times as potent as krait venom, and Lamb's results compared with the same trio's concedes to cobra venom a toxicity twenty times that of the krait. Lamb,* however, from his own researches with both poisons on rabbits, shows that krait venom is proximately four times as virulent as cobra venom. In considering the question it must be borne in mind that samples of venom from individuals of the same species vary somewhat, thus Lamb fixed the minimal lethal dose of cobra venom for rats with one sample at ·04 milligrammes per kilogram weight, and with another sample found it was ·07 milligrammes.† Again animals vary in their susceptibility to different venoms, thus Lamb found a rat more susceptible to cobra venom than a rabbit, but a rabbit more susceptible than a rat to *Enhydrina* venom.‡ It is reasonable to suppose that the quality of the secretion may be affected by health, in fact we know it is, for Lamb has remarked with others on the decrease in quality and quantity of venom in snakes kept in captivity. Doubtless season, and possibly youth, and old age similarly affect the poison secreted. Further there are the conditions affecting the animals experimented upon. Not all individuals of the same species are equally susceptible, and health and age doubtless modify their susceptibility. Again I have shown, I think, good reason to suppose that the snake *Bungarus candidus* as hitherto understood includes 3 or 4 forms which may be distinct species. If all these forms are mixed up, and their poisons which may be very different in toxicity, collected together as krait venom, this alone might account for the conflicting results. In future experiments I think every care should be taken to keep the poisons of the various forms apart.

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* "*Snake poison and Snake bite,*" p. 8. This reference is the same as that appearing in Clifford Allbutt's System of Medicine (Lamb and Martin).

† Mémoirs officers. Govt. of India No. 5, p. 14. ‡ Loc. cit., p. 7.

The possible factors which may contribute to a want of uniformity, other than the supposition that the venom of several species has been mixed, are each taken by itself trifling, and one would expect a more proximate agreement in results than that actually obtained.

Lepidosis. *Rostral.*—Touches 6 shields; the rostro-nasal sutures longest and about twice the rostro-labial which are shortest. *Internasals.*—The suture between the fellows about half that between the præfrontal fellows; two to three-fifths the internaso-præfrontal. *Præfrontals.*—The suture between them greater than the præfronto-frontal, touch the internasal, postnasal, præocular, supraocular, and frontal. *Frontal.*—Touches 6 shields which are subequal or the fronto-parietals largest. *Supraoculars.*—Breadth about half, length about two-thirds the frontal. *Nasals.*—Touch the 1st and 2nd supralabials, the suture from the nostril passing to the 1st. *Præoculars.*—One. *Postoculars.*—Two. *Temporals.*—One anterior touching the 5th and 6th supralabials. *Supralabials* 7, the 2nd as broad as the 3rd, the 3rd and 4th touching the eye. *Infralabials.*—The 4th is much the largest of the series, and touches 2 scales behind. *Sublinguals.*—Two pairs; the anterior largest, the posterior touching only the 4th of the infralabial series. *Costals.*—Two heads lengths behind the head 15, midbody 15, two heads lengths before the anus 15, the last row deeper than the rest; keels absent: apical pits absent. *Vertebrals.*—Broader than long in almost the whole body length, about twice as broad as the uppermost costal.* *Ventrals.*—200 to 218. *Anal.*—entire. *Subcaudals.*—38 to 50; all entire. *Dentition and Jaws.*—*The maxilla* extends forward as far as, and is as long as the palatine. Anteriorly it supports two fangs which are placed side by side. The fangs are canaliculate and the seams where

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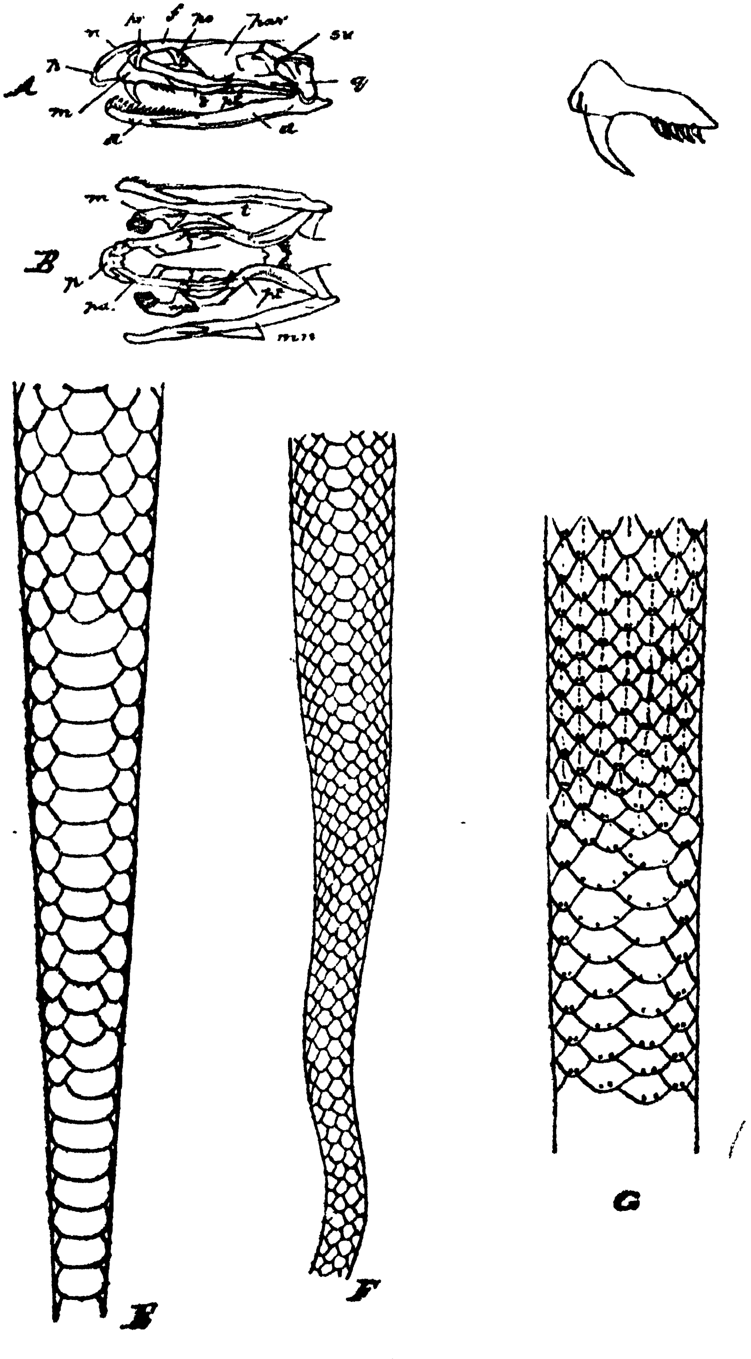
* The enlargement begins gradually in the neck, and usually without a coalescence of scales. In this respect it differs from the species of *Dendrophis* and *Dendrelaphis* where the enlargement is due to a fusion of the 3 median rows, and begins therefore suddenly. Posteriorly the enlargement persists along the whole length of the tail, a peculiarity seen in the kraits alone of all the snakes that exhibit enlarged vertebrals. Here the vertebral row gradually reduces in breadth, and suddenly enlarges at intervals owing to an absorption into it of the rows on each side (Fig. E, Diagram I.). In other snakes with enlarged vertebrals the enlargement ceases above the anus (Fig. F., Diagram I.). In these as in most other snakes the scales which have been in an odd number of rows become arranged above the anus in even rows, and the absorption of rows is brought about by a fusion of the two uppermost supracaudals on each side, at each step (Fig. G., Diagram I.).



INDIAN SNAKES (WALL).

the walls of the canal meet on the anterior face are much more apparent than in viperine fangs. Behind the maxilla supports four small subequal teeth which are strongly grooved on their outer faces.

Palato-pterygoid.—The palatine bone equals the maxilla in length and supports 10 or 11 subequal teeth all of which are grooved on their inner faces. The pterygoid bone is more than twice as long as the palatine, but bears teeth only anteriorly, in rather more than one-third of its length. The teeth numbering about 11 slightly decrease in size posteriorly, and are feebly grooved on their inner faces. The *transpalatine* bone is rather longer than the tooth-bearing part of the pterygoid.

The Mandible equals the skull in length. It bears about 15 teeth in the dentary bone which is about two-fifths the length of the entire mandible. The teeth are subequal in size except the 2nd, 3rd and 4th which are rather the longest. All are grooved on their outer faces. The accompanying figures illustrate these remarks, and show most of the bones of the skull.

Our Plate is good. Figures 4 to 7 are all taken at midbody, and from specimens in the British Museum. Figures 1 to 3 are from the specimen whose body marks are represented in Figure 5.

EXPLANATION OF DIAGRAM I.

A. Skull of *Bungarus cæruleus* profile.
B. „ „ „ basal aspect to show jaws and dentition.
C. Maxilla of „ „ profile } enlarged.
D. „ „ „ from below } enlarged.
(*a*) Articular bone of mandible.
(*d*) Dentary „ „
(*f*) Frontal, (m) Maxilla, (mn) Mandible, (n) Nasal.
(*p*) Præmaxilla, (pa) Palatine, (par) Parietal.
(*po*) Postfrontal, (pr) Præfrontal, (pt) Pterygoid.
(*q*) Quadrate, (sn) Supratemporal, (t) Transpalatine or Ectopterygoid.
E. Supracaudals of *Bungarus cæruleus.*
F. „ of *Dipsadomorphus hexagonotus.*
G. „ of *Zamenis korros.*

The dotted lines in figures E., F., G. show the site of the anus.

NOTES ON THE CLASSIFICATION OF THE BANDICOOTS.

By R. C. Wroughton.

The Bandicoots were first separated from the Rats (*Mus*) by Gray in 1842 (Ann. & Mag. Nat. Hist. xii. p. 264) under the generic name *Nesokia* (the modification of the name to *Nesocia* by Blanford and others is without authority). The type of the genus was the species discovered by Col. Hardwicke and generally known as *Nesokia hardwickei;* for this name, however, must be substituted the earlier one *indica* of Gray and Hardwicke. The same specimen (B. M. no. 99*a*) is the type of both names.

Almost since Gray's time several well-marked groups have been generally recognized, and recently Mr. Thomas, basing on these groups, has divided the genus into three (Ann. & Mag. Nat. Hist. xx. p. 202, 1907), as shown in the following key :—

A. Size small ; tail very short, less than ⅔ of head and body ; mammæ 2—2 = 8. Skull short and broad : palatal foramina short ... ... I. Nesokia, Gray.

B. Size small ; tail fairly long, more than ⅔ of head and body ; mammæ irregular (14—18). Skull broad ; palatal foramina long ... ... II. Gunomys, Thos.

C. Size large ; tail long, almost as long as head and body ; mammæ 3—3 = 12. Skull long and narrow ; palatal foramina long ... ... III. Bandicota, Gray.

I. NESOKIA.

1842. *Nesokia*, Gray, Ann. Mag. Nat. Hist. x. p. 264.

1860. *Spalacomys*, Peters, Abhandl. königl. Ak. Wiss. Berlin, p. 139.

Type species, *Arvicola indica*, Gray and Hardw. (= *Nesokia hardwickei*, Gray et auctorum). Through some extraordinary mistake there was a transposition (at least in part) of the descriptions in the publication of the two species *hardwickei* and *kok* (Mag. Nat. Hist. i. p. 585, 1832). The result of this error was a confusion which was noted by Peters in the paper (*l. c.*) in which he proposed the generic name *Spalacomys*, which he rightly stated could only be cleared up by reference to the types. The same specimen (B. M. no. 99*a*) is the type of both *Arvicola indica*, Gray and Hardw., and *Mus hardwickei*, Gray, so that the genus *Nesokia*, like *Spalacomys*, is based on the northern form of Bandicoot, and *Nesokia*, as the earlier name, stands, and *Spalacomys* becomes a synonym.

The genus is not well represented in the National Collection. There is a series of specimens from Rajputana and odd ones from Fategarh, Delhi, &c., and this would seem to be the southern and eastern limit of distribution of the genus. Northwards it has been found as far as Lob Nor (40° N. lat.), and it extends at least as far west as Cairo.

The fur varies between wide extremes—from the coarse, short, harsh, almost bristly pelage of the southern lowland forms (*N. indica*, &c.) to the fine, long, silky coat of *N. brachyura* in the far north. All the species have a certain number of longer coarser hairs scattered over the back and flanks, but especially on the rump, which extend beyond the ordinary fur. In all cases the tail is practically naked; the sparse minute hairs with which it is clothed are only visible under a lens; the hands and feet are but little better clothed. The colour-pattern in all species is the same. Individual hairs are more or less dark slate-colour for at least three-fourths of their length, the balance being a pale tip. The colour of this pale tip and the extent to which the underlying slate-colour shows through determine the general colour of the species. The colour of the back merges gradually into that of the flanks and belly without any sharp line of demarcation; the lower surface is paler than the upper.

The following is a key to the species of *Nesokia* (as now restricted):—

A. Length of head and body more than 250 mm.
  ***a*. Tail very short (120 mm.). Alveolar length of upper molar series 12 mm. (Lob Nor.) ... (1) *N. brachyura*, Büchn.**
  ***b*. Tail longer (130 mm.). Alveolar length of upper molar series 11 mm. (Yarkhand.) (2) *N. scullyi*, Wood-Mason.**
  ***c*. Tail longer (135 mm.). Alveolar length of upper molar series 10·5 mm. (Palestine.) (3) *N. bacheri*, Nehring.**
B. Length of head and body more than 180 mm.
  ***a*. Hair coarse, coat harsh. (Rajputana.) ... (4) *N. indica*, Gray & Hardw.**
  ***b*. Hair fine, coat soft. (Egypt.) ... ... (5) *N. suilla*, Thos.**
C. Length of head and body more than 160 mm.
  ***a*. Alveolar length of upper molars 9 mm. (Pindi, Kuram, &c.) ... ... (6) *N. griffithi*, Horsf.**
  ***b*. Alveolar length of upper molars 8·5 mm.**
    ***a'*. Hair coarse, harsh. (Central Sind Desert.) ... ... (7) *N. beaba*, sp. n.**
    ***b'*. Hair soft, silky. (Caspian Sea.) ... (8) *N. bailwardi*, Thos.**

D. Length of head and body less than 160 mm.

a. Colour brighter. (Kandahar.) ... ... (9) *N. huttoni*, Blyth.

b. Colour duller. (Merv.) ... ... (10) *N. satunini*, Nehring.

NOTE.—*N. huttoni satunini* was described by Nehring from the Merv Oasis in 1892 (*l. c. inf.*), but ten years earlier Raddle and Walter (Zool. Jahrb. iv. p. 1036, 1889) described *N. boettgeri* from the bank of the Amu Darya, where the Trans-Caspian Railway crosses that river. The type localities of the two species were therefore close together.

I have seen no specimen of *N. boettgeri*, and, except that the tail-length is given as 46 mm., I can find no essential differences between it and *N. satunini*. If the tail-length recorded for the Amu Darya specimen is incorrect, it is probably not different from the Merv species. This seems to be the conclusion also arrived at by Mr. Thomas (Ann. and Mag. Nat. Hist. xx. p. 200, 1907).

(1) *Nesokia brachyura*, Büchn.

1889. ***Nesokia brachyura*, Buchner, Mamm. Przewalsk p. 82.**

Fur long (25—30 mm. on back) and soft; scattered hairs on flank and rump 10 mm. longer.

Pale tips of hairs buff on the back, fading to white on the belly. General colour from tawny on the back to greyish white on the belly. Hands, feet, and tail pale.

Dimensions:—

Head and body 257 mm.; tail 116; hind foot 43; ear 11·2.

Skull: basilar length 45; zygomatic breadth 42; alveolar length of upper molar series 12.

Hab. Lob Nor (lat. 40° N., long. 90° E.).

Very closely related to the next species; it appears to have a proportionally shorter tail and a longer skull (especially noticeable in the portion in front of the orbits). A cotype in the Natural History Museum, received from the St. Petersburg Museum, gives measurements even more close to those of *N. scullyi*.

(2) *Nesokia scullyi*, Wood-Mason.

1876. ***Nesokia scullyi*, Wood-Mason, Proc. As. Soc. Beng. p. 80.**

The type specimen (skin and skull) is the only known representative of this species. Blanford has figured it ('Second Yarkand Mission: Mamm.,' p. 49, pls. viii. *a*, x. *a*), and both he and Dr. Anderson (J. A. S. B. p. 224, 1878) have re-described it.

Fur long (20 mm. on back, *teste* Blanford, *l.c.*), soft and silky.

Pale tips of hairs pale fawn-colour on the back, whitish on the belly. The general colour is thus very much as in *N. brachyura* (this is confirmed by comparing Buchner's and Blanford's coloured figures of the two animals). Hands, feet, and tail "flesh-colour."

Dimensions of the type :—

Head and body 168 mm.*; tail 132; hind foot 43; ear 15.

Skull: basilar length 40; zygomatic breadth 30; alveolar length of upper molar series 11.

Hab. Yarkhand.

(3) *Nesokia bacheri*, Nehring.

1897. ***Nesokia bacheri***, **Nehring, Zool. Anzerig. no. p. 547, 503.**

Nehring described this species from spirit-specimens, and gives no details of fur-texture. He states the general colour to be reddish brown. Hands, feet, and tail pale. He records the following dimensions :—

Head and body 268 mm.; tail 135; hind foot 40.

Skull: basilar length 46; zygomatic breadth 32; alveolar length of upper molar series 10.

Hab. Palestine.

(4) *Nesokia indica*, Gray & Hardw.

1832. ***Arvicola indica***, **Gray & Hardwicke, Ill. Ind. Zool. i. pl. xi.**

1837. ***Mus hardwickii***, **Gray Mag. N. H. i. p. 585.**

Fur rather coarse and short (15 mm. on back).

The buff tips of the hairs rather long, which, as the coat is rather thick, gives a general yellowish-brown coloration above; belly dirty white. Hands, feet, and tail flesh-colour.

Dimensions :—

Head and body 210 mm.; tail 110; hind foot 34.

Skull: basilar length 39; zygomatic breadth 30; alveolar length of upper molar series 9.

Hab. The locality of the type is merely recorded as "India." There is, however, a series from the Sambhar Lake and Jeypur in Rajputana in the National Collection which I believe to be this species. Other specimens from Tong in Baluchistan do not seem materially to differ, while still others from Fatehgar are too young to afford reliable data.

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* The dimensions of the type were recorded by Dr. Scully as: "Total length 11″·8; tail 5″·2." From this it has been deduced that the head and body measurement is "6″·6"= 168 mm.; but this is palpably a mistake, probably between 250 and 260 mm. is the true

(5) *Nesokia suilla*, Thomas.

1907. *Nesokia suilla*, Thomas, Ann. & Mag., Nat. Hist. xx. p. 203.

Fur finer than in *N. indica*, but by no means soft and silky as in *N. scullyi*, *brachyura*, &c. About 15 mm. in length on the back.

Coloration much as in *N. indica*, but on the average a trifle yellower.

Dimensions :—

Head and body 185 mm.; tail 113 ; hind foot 32 ; ear 16.

Skull : basilar length 39 ; zygomatic breadth 27 ; alveolar length of upper molar series 8·8.

Hab. Upper Egypt. (Type from Suez, others from Cairo, &c.)

(6) *Nesokia griffithi*, Horsfield.

1851. *Nesokia griffithi*, Horsfield, Cat. p. 145.

The type is in the Museum Collection, but it is a quite young animal. There are specimens, however, from Rawal Pindi, Hassan Abdool, Kohat, which are neither *N. indica* nor *huttoni*. and with which the type of *N. griffithi* agrees quite well. If my identification is correct :—

Fur in length and texture very much as in *N. suilla*.

Coloration as in *N. indica*. Hands, feet, and tail pale.

Dimensions of an old female from Rawal Pindi collected by Major Birrell, R.A.M.C. :—

Head and body 160 mm.; tail 113 ; hind foot 30 ; ear 18.

Skull: basilar length 37 ; zygomatic breadth 18 ; alveolar length of upper molar series 9.

Hab. Type locality recorded as "Pushut." The localities mentioned above point to a habitat on the W. Himalayas.

(7) *Nesokia beaba*, sp. n.

A bandicoot resembling *N. indica*, but smaller.

Size intermediate between *N. indica* and *huttoni*.

Fur very coarse and harsh, short (10-12 mm. on back).

General colour drab with a brown tinge above, grey on the belly. Hands, feet, and tail darker than in *N. indica*.

Skull same shape as in *N. indica*, but much smaller than in that species.

Dimensions :—

Head and body 164 mm. ; tail 113 ; hind foot 30 ; ear 16.

Skull : basilar length 35 ; zygomatic breadth 26 ; alveolar length of upper molar series 8·5.

Hab. Pithoro, Central Sind Desert.

Type. Old female. B. M. No. 8.9.13.9. Original number B.G. 2. Collected at the instance of the Bombay Government on 24th September 1907, and presented to the Natural History Museum by the Bombay Natural History Society.

(8) *Nesokia bailwardi*, Thomas.

1907. *Nesokia bailwardi*, Thomas, Ann. & Mag., Nat. Hist. xx. p. 199.

Fur of medium length (15 mm.), very fine and soft.

Pale tips of hairs short, buffy, giving a general colour above near "wood-brown," greyish white below.

Dimensions :—

Head and body 167 mm. ; tail 123 ; hind foot 33 ; ear 24.

Skull : basilar length 37 ; zygomatic breadth 27 ; alveolar length of upper molar series 8·5.

There is a strong resemblance between this species and *N. griffithi*, but the stouter teeth of the latter easily distinguish it ; both these forms are separated at once from *N. beaba* by the coarse bristly coat of this last species.

Hab. South shore of Caspian Sea.

(9) *Nesokia huttoni*, Blyth.

1846. *Nesokia huttoni*, Blyth, J. A. S. B. xv. p. 139.

Fur very soft, close and fairly long (20 mm. on back).

General colour above a bright fawn, fading to greyish white on the belly. Hands, feet, and tail flesh-colour.

Dimensions :—

Head and body 150 mm. ; tail 100 ; hind foot 30.

Skull : basilar length 38 ; zygomatic breadth 26 ; alveolar length of upper molar series 8·5.

Hab. Kandahar. The Museum has also specimens collected by Blanford at Tong and Kalagan in Baluchistan.

(10) *Nesokia satunini*, Nehring.

1880 (?). *Nesokia boettgeri*, Radde & Walter, Zool. Jahrb. iv. p. 1036.

1890. *Nesokia huttoni satunini*, Nehring, S. B. Ges. naturf. Fr. Berl. vii p. 108.

I have already referred to *N. boettgeri* (*v. sup.* footnote to key, p. 738). Of *N. h. satunini* the Museum possesses a cotype presented by the Branicki Museum, Warsaw.

The fur is rather coarser and shorter (155 mm. on back) than in the last species, but equally full and close.

The colour is darker and duller, approaching "clay-colour." The hands, feet, and tail pale.

The dimensions are :—

Head and body 153 mm.; tail 102; hind foot 30.

Skull: basilar length 34; zygomatic breadth 25: alveolar length of upper molar series 8.

Hab. Merv, Transcaspia.

Besides the darker duller colour, other differences from *N. huttoni* are the smaller teeth and rather broader braincase.

II.—GUNOMYS.

1907. *Gunomys*, Thomas, Anna. & Mag. Nat. Hist. xx. p. 203.

Type species, *Arvicola bengalensis*, Gray and Hardwicke (= *Nesokia bengalensis* auctorum).

Considering how widespread the genus is throughout India, it is even worse represented in the National Collection than *Nesokia.* Col. A. E. Ward has sent specimens from the Jhelum Valley, Kashmir, and this Society specimens, obtained through the Bombay Government, from Pithoro in Sind. The Indus River may be accepted as the western boundary of the genus, and it is hemmed in on the north by the Himalayas. It ranges through Burmah into the Malay Peninsula, thus extending southwards practically to the Equator.

The fur, as was to be expected, varies even more in this genus than in *Nesokia*; the difference between the fine long silky fur of *wardi* from Kashmir and the coarse, short, harsh coat of *varius* from Penang is about as great as could be imagined.

The general colour-pattern is the same as in *Nesokia;* indeed, *G. wardi* and *N. griffithi* are almost indistinguishable by mere colour, and a similar close likeness is found between the *Nesokia* and *Gunomys* of Lower Sind.

The tail is, on the average, ¾ the length of the head and body.

The following is a key to the species of *Gunomys* so far as I have been able to tabulate them with the incomplete material at my disposal :—

A. Length of upper molar series less than 7·5 mm.
  a. Larger, head and body more than 200 mm. Skull length 43 mm. (Lower Bengal.) ... (1) *bengalensis*, G. & H.
  b. Smaller, head and body less than 200 mm. Skull length 41 mm.
    a^1. Upper molar series 7·2 mm. (Penang.) ... (2) *varillus*, Thos.
    b^1. Upper molar series 6·6 mm. (Ceylon.) ... (3) *gracilis*, Nehr.
B. Length of upper molar series more than 7·5 mm.
  a. Fur fine, silky, long (25 mm.) (Kashmir.) ... (4) *wardi*, sp. n.
  b. Fur coarser, soft or harsh, short (13—16 mm.)
    a^1. Size large (head and body more than 200 mm.). Fur coarse and harsh.
      a^2. Colour mixed buff and black. Upper molar series 7·6 mm. (Penang.) ... ... (5) *varius*, Thos.
      b^2. Colour brown. Upper molar series 8·3 mm. (Konkan.) ... ... (6) *lordi*, sp. n.
    b^1. Size smaller (head and body less than 200 mm.).
      a^2. Fur coarse and harsh. Upper molar series 8·3 mm. (Sind.) ... ... (7) *sindicus*, sp. n.
      b^2. Fur finer, softer. Upper molar series 8 mm. or less.
        a^3. Belly greyish white. (Carnatic and Dekhan) ... ... (8) *kok*, Gray.
        b^3. Belly strongly tinged yellow. (Nepal.)... (9) *tarayensis*, Horsf.

(1) *Gunomys bengalensis*, Gray.

1833. *Arvicola bengalensis*, Gray and Hardw., Ill. Ind. Zool. ii. pl. 21.
1854. *Mus dacoaensis*, Tytler, Ann. & Mag. Nat. Hist. xiv. p. 173.
1878. *Mus* (*Nesokia*) *blythianus*, Anderson, J. A. S. B. xlvii. p. 227.
1878. *Mus* (*Nesokia*) *barclayanus*, Anderson, J. A. S. B. xlvii. p. 229.

This is the species of Lower Bengal ; the type is not available, but I have seen specimens from Calcutta which may be confidently accepted as representing it.

Fur harsh, sparse, and rather short (14-15 mm. on back). General colour above mottled buff and dark brown, the belly greyish.

Blanford records the dimensions of an old male as follows :—

Head and body 205 mm. ; tail 160 ; hind foot 32·5 (this must be meant for 37·5) ; ear 20·8.

Skull dimensions of an old male from Calcutta are :—

Greatest length 43 ; basilar length 38·3 ; zygomatic breadth 25 ; brain-case breadth 16·3 ; interorbital breadth 6·7 ; nasals 13·8 ; diastema 14 ; upper molar series 6·8.

Hab. Lower Bengal. *Nesokia blythianus* of Anderson is almost certainly a synonym of *bengalensis*, and it seems most likely that his *barclayanus* from Ghazipur is the same. I have seen a spirit-specimen from Moulmein, an adult female, which tallies with the above measurements ; it seems to approach *varius* in its colouring.

(2) *Gunomys varillus*, Thomas.

1907. ***Gunomys varillus*, Thomas, Ann. & Mag. Nat. Hist. xx. p. 205.**

I quote from Thomas's original description :—

" Size very small. Fur coarse. General colour above about as in *G. varius*, or rather more buffy, but the mixture is finer, not so coarsely variegated. Under surface dull greyish. Hands and feet brown.

" Dimensions of the type (measured in the skin) :—

" Head and body 184 mm. ; tail 137 ; hind foot 36·5 ; ear 16."

Skull : greatest length 40·5 ; basilar length 35 ; zygomatic breadth 23 ; brain-case, breadth 16·5 ; interorbital breadth 5·7 ; nasals 13 ; diastema 13 ; upper molar series 7·2.

Hab. The type locality is Penang, Malay Peninsula.

(3) *Gunomys gracilis*, Nehring.

1850. ***Mus dubius*, Kelaart, J. Ceyl. As. Soc. v. p. 217. (Preoccupied.)**

1902. ***Nesokia gracilis*, Nehring, S.B. Ges. nat. Fr. Berl. p. 116.**

A small species with fine short fur (15 mm. on back). General colour dark brown above, whitish grey below. Hands and feet pale.

Dimensions (as given by Nehring) :—

Head and body 195 mm. ; tail 150 ; hind foot 31 ; ear 18.

Skull : greatest length 4·1 ; basilar length 35·6 ; zygomatic breadth 24·3 ; brain-case breadth 16·3 ; interorbital breadth 6·3 ; nasals 11·7 ; diastema 12·1 ; upper molar series 6·6.

Hab. Ceylon.

(4) *Gunomys wardi*, sp. n.

A *Gunomys*, superficially, closely resembling *Nesokia griffithi*, but with a proportionally longer tail and dark feet.

Size about the same as *Nesokia indica.* Fur long (25 mm. on back), soft and silky. General colour above 'mummy brown,' individual hairs "slate-grey" basally for three-fourths their length, then buff; below whitish grey, individual hairs "slate grey" with white tips, chin white; hands dark, the fingers white; feet rather densely clothed with short hairs, dark umber-brown above, white on the sides.

Dimensions of type (measured in the flesh):—

Head and body 198 mm.; tail 155; hind foot 37; ear 25·5.

Skull: greatest length 45 (c.), basilar length 39 (c.); zygomatic breadth 26·5; diastema 13; length of upper molar series 8.

Hab. Kashmir. (Type from Pandritton, 5,500'.)

Type. Adult male. B. M. no. 8. 7. 6. 34. Original number 791. Collected 25th November, 1906, by C. M. Crump, and presented to the Natural History Museum by Col. A. E. Ward.

Five specimens in all examined. The tail seems to average rather short for a *Gunomys*: in the type it is fairly normal for the genus, but in other specimens it barely exceeds two-thirds the length of the head and body. The long, thick silkly coat serves to distinguish it at a glance from any other *Gunomys.* I have much pleasure in naming this very distinct species after Col. Ward.

(5) *Gunomys varius*, Thos.

1908 *Gunomys varius*, Thomas, Ann. & Mag. Nat. Hist. xx, p. 204.

Thomas, in describing this species, says:—"Size decidedly larger than in *G. bengalensis.* Fur very coarse and harsh, though not to be called spiny. General colour above coarsely mixed black and cream-buff, without the brown tints of *bengalensis.* Under surface dull grizzled greyish. Hands and feet brown on the middle of the metapodials, whitish laterally and on the digits.

"Dimensions of the type (measured in the flesh):—

"Head and body 266 mm.; tail 197; hind foot 40; ear 19."

Skull: greatest length 48; basilar length 43; zygomatic breadth 26·7; brain-case breadth 18·2; interorbital breadth 6·5; nasals 16; diastema 16·3; upper molar series 7·6.

Hab. The type locality is Penang, Malay Peninsula.

(6) *Gunomys lordi*, sp. n.

A *Gunomys* of the large-toothed *kok* group, of large size and short harsh fur.

Size considerably larger than *G. bengalensis*. Fur sparse, harsh and rather short (15-17 mm. on the back). General colour above mingled buff and black (or very dark brown); individual hairs slaty brown with buff tips, with, however, large proportion of rather longer black hairs. Under surface dirty white, the hairs white to their bases. Hands and feet pale brown above, whitish on the sides.

Dimensions of the type (measured in the flesh):—

Head and body 243 mm.; tail 195; hind foot 44; ear 24.

Skull: greatest length 48; basilar length 40; zygomatic breadth 28; brain-case breadth 18·5; interorbital breadth 7·3; nasals 15·5; diastema 15; upper molar series 8·3.

Hab. Konkan Districts of Bombay. (Type from Kolaba Dist.)

Type. Old male. B. M. No. 8. 9. 13. 1. Original number W. L. 193. Collected 8th July by the Rev. W. Lord and presented to the Natural History Museum by the Bombay Nat. Hist. Society.

(7) *Gunomys sindicus*, sp. n.

A *Gunomys* of the *kok* group and closely resembling *G. lordi*, but smaller in size.

Size as in *G. bengalensis*. Fur as in *G. lordi*, but slightly less harsh. General colour above paler than in *lordi*, the pale tips of individual hairs lighter and extending to nearly half their length; below pale whitish grey, basal half of individual hairs very pale grey, the rest white.

Skull much as in *lordi*, but smaller in all dimensions. Basal two-thirds of anterior margin anteorbital plate evenly concave. Teeth: incisors rather lighter than in *lordi*, molars as in that species.

Dimensions of type (measured in the flesh):—

Head and body 199 mm.; tail 165; hind foot 33; ear 23.

Skull: greatest 45; basilar length 39; zygomatic breadth 26·5; brain-case breadth 17·3; interorbital breadth 6; nasals 12·6; diastema 14·1; upper molar series 8·3.

Hab. Lower Sind. (Type from Pithoro, Central Sind Desert.)

Type. Old female. B. M. No. 8. 9. 13. 7. Original number B. G. 53. Collected under instructions from the Bombay Government, and presented to the Natural History Museum by the Bombay Nat. Hist. Society.

This species, though somewhat resembling *G. lordi*, is easily separable on size. The dimensions of an exceptionally large male of this species were recorded by the collector as follows:—Head and body 201 mm.; tail 173; hind foot 35; ear 24.

(8) *Gunomys kok*, Gray.

1837. ***Mus kok***, **Gray, Mag. Nat. Hist. i. p. 585.**

1839. ***Mus (Neotoma) providens***, **Elliot, Madr. Journ. L. & S. p. 210.**

The type of the species was taken by Elliot in the Carnatic, whence it extends northwards into the Dekhan. Specimens from Ahmednagar are apparently identical with those from Dharwar.

Size rather smaller than *bengalensis*. Fur rather soft and coat thicker but not longer as compared with *bengalensis*. General colour above nearly uniform brown; below whitish grey.

Sir W. Elliot records the dimensions of an old male as follows:—

Head and body 175 mm.; tail 163: hind foot 35; ear 23.

Skull: greatest length 41·5; basilar length 36·3; zygomatic breadth 25; brain-case breadth 17; interorbital breadth 6·2; nasals 12·3; diastema 13; upper molar series 8. These skull-measurements are taken from the cotype, which, though adult, is not old. The skull of an older male from Ahmednagar gives barely a millimetre more in greatest length.

Hab. The type locality is Southern Mahratha Country.

(9) *Gunomys tarayensis*, Horsf.

1855. ***Mus tarayensis***, **Horsf, Ann, & Mag. Nat. Hist xvi. p. 112.**

1855. ***Mus plurimammis***, **Horsf, *loc. cit.***

1855. ***Mus morungensis***, **Horsf, *loc. cit.***

The types of *tarayensis*, *plurimammis*, and *morungensis* are all in the Museum Collection, and undoubtedly belong to one species. *G. tarayensis* belongs to the small-toothed group, in which the oldest name is *bengalensis*.

No dimensions are recorded, but, judging from size of skull and length of hind foot, *tarayensis* is rather smaller than *bengalensis*.

Fur rather harsh (not so harsh as in *bengalensis*) but short (13-15 mm. on back). General colour above brighter than in *bengalensis*, below markedly suffused with yellow.

No dimensions are recorded, but the dry hind foot is 35 mm.

Skull: greatest length 41; basilar length 36; zygomatic breadth 25; brain-case breadth 17; interorbital breadth 6·2; nasals 12; diastema 13; upper molar series 7·8.

Hab. Nepal.

In all three specimens examined the yellow suffusion on the belly is well marked.

III. BANDICOTA.

1873. *Bandicota*, Gray, Ann. & Mag. Nat. Hist. xii. p. 418.

Type species, *Bandicota gigantea*, Hardw.

This genus, which contains the real "Bandicoots" (from Tel. "pandi koku"=pig-rat, on account of the grunting note made by them when attacked), is unfortunately still worse represented in the Museum Collection than the other two—so meagrely, indeed, that I put forward the following as merely a tentative arrangement pending the receipt of more and better material. The most northerly locality from which, to my knowledge, the genus has been obtained is Delhi, *i.e.* say 38° N. lat. South of that it is represented throughout the Peninsula and Ceylon, it crosses into Burma, and has been taken in Java and Formosa.

In most of the species the scattered long hairs present in *Nesokia* and *Gunomys* are so multiplied that they form a sort of "mantle" on the lower back and rump completely hiding the underfur. Usually the colour-pattern is a buffy grey, modified to a greater or less extent by the "mantle" of long hairs.

The following key to the known species of *Bandicota* is the best I have been able to arrange from the material at my disposal :—

A. Size large: hind foot more than 60 mm.
(Hurdwar.) ... ... (1) *gigantea*, Hardw.
B. Size medium : hind foot 54-55 mm.
a. Tail proportionally longer ; colour of underfur brown ; skull stouter. (East Coast, Madras.) ... ... (2) *malabarica*, Shaw.
b. Tail proportionally shorter ; colour of underfur greyish white ; skull slimmer. (Java.) ... ... (3) *setifera*, Horsf.
C. Size small : hind foot 48-51 mm.
a. Colour almost black.
a^1. Skull stouter, coarser. (Calcutta.) ... (4) *elliotana*, Anders.
b^1. Skull more delicately made. (East Coast, Madras.) ... ... (5) *indica*, Bechst.
b. Colour brown. (Nepal.) ... ... (6) *nemorivaga*, Hodgs.

(1) *Bandicota gigantea*, Hardw.

1804. *Mus giganteus*, Hardwicke, Trans. Linn. Soc. vii. p. 306.

Hardwicke (*l. c.*) professedly substituted "*giganteus*" for *malabaricus*, Shaw, as a more suitable name, because he had found a large Bandicoot a long way from Malabar. This, of course, is inadmissible. Fortunately he at the same time published a description and figure, and these, with a type specimen collected by himself and now in the Natural History Museum Collection, prove quite conclusively that Hardwicke's was a larger and quite distinct form from *malabaricus*.

Fur rather harsh, 25 mm. long on the back : a large admixture of longer hairs, varying from 40 mm. on the sides to 100 mm. on the back. General colour above greyish-white, suffused with dark brown; under surface greyish. Hairs of underfur pale "drab-grey" with white tips, longer hairs "seal-brown." Hands and feet wood-brown. Tail sparsely clothed with very short hairs, dark, very often, if not always, with a short white tip.

Dimensions of an old male from Rajputana :—

Head and body 360 mm. ; tail 300 ; hind foot 62·5 ; ear 15.

Skull ; greatest length 69 ; basilar length 61·5 ; zygomatic breadth 36·3 ; nasals 28 ; diastema 21 : length of upper molar series 12.

Hardwicke quotes for his type, an old female :—

Head and body 331 mm. ; tail 325 : hind foot of type measured on the dry specimen is 60 mm.

Habitat.—The type locality is Hurdwar.

Hardwicke, confusing it as he did with the Malabar form, gave no definite habitat for *gigantea*. The Natural History Museum, besides Hardwicke's specimens, which were probably from Hurdwar, has specimens from Rajputana and Delhi, which must, for the present at any rate, be allotted to this species. Whether it goes further north and how far south it ranges must remain doubtful until more material is available.

(2) *Bandicota malabarica*, Shaw.

1801. ***Mus malabaricus***, **Shaw, Gen. Zool., p. 54.**

1839. ***Mus (Neotoma) giganteus***, **Elliot, Madr. Journ. L. & S., p. 209.**

Shaw thought he was dealing with Pennant's Perchal and Bandicote Rats, but, as his name shows, he had West Coast specimens to deal with. I have no actual topotypes to guide me, but some specimens from Travancore show a marked difference from those I have identified as *B. indica*, especially in skull-characters. It is markedly larger. I quote with some hesitation the dimensions recorded on a Travancore specimen :—Head and body 300 mm. ; tail 316 ; hind foot 55. The tail in *malabarica* seems to be constantly long in proportion to the head and body, but I can scarcely think that it is so to the extent claimed. I have only skulls (no skins) from the Carnatic, but these agree with *malabarica*. The skull much resembles that of *elliotana* in size, but is even broader and more coarsely made.

The dimensions of the skull of an old female from Trevandrum District are :—

Greatest length 60 mm. ; basilar length 54 ; zygomatic breadth 33·5 ; nasals 24 ; diastema 21 ; upper molar series 10·5.

Habitat.—Malabar Coast.

So far as material is available for judging, the Ceylon form is not separable from *malabarica*. It seems to have a proportionally shorter tail, but the skulls of the two forms are closely alike.

(3) *Bandicota setifera*, Horsf.

1824. *Mus setifer*, Horsf. Zool. Res. Java.

[*Mus. ioria*, Hamilton, quoted by Horsfield (*l. c.*), but apparently never published.]

A specimen quite recently received from Java shows that this species very closely resembles *B. indica*. Even the small amount of rufous tinge on the underfur of *indica* is absent in *setifera*. The skull is slightly larger and coarser in all details than that of *indica*, teeth are broader, bullæ larger, &c.

Dimensions of adult male (taken in the flesh) :—

Head and body 290 mm. ; tail 245 ; hind foot 54 ; ear 31.

Skull : greatest length 57 ; basilar length 50 ; zygomatic breadth 32 ; nasals 21 ; diastema 18 ; upper molar series 10·6.

Habitat.—Java.

(4) *Bandicota elliotana*, Anders.

1878. *Mus (Nesokia) elliotanus*, Anders. J. A. S. B. xlvi. p. 231.

Anderson's type, if extant, is not available for examination. He probably mixed two forms, one from Calcutta, the other from Purneah. The latter is probably identical with or closely related to *B. nemorivaga* ; the former, judging by a specimen recently received from the Indian Museum, is a good species.

It is smaller than *B. gigantea*. It differs from all other forms of this group by the absence of the "mantle" of long hairs which characterises the *B. gigantea* group, in this rather resembling *B. nemorivaga* and its allies. The underfur is a greyish white tipped with bright buff. The skull is considerably smaller than in *gigantea*, with rather short nasals, very different, as Anderson points out, from the broad nasals of *gigantea*.

Dimensions of the Indian Museum specimen mentioned above, taken in the flesh, are :—

Head and body 275 mm. ; tail 235 ; hind foot 51 ; ear 21.

Skull : greatest length 58 ; basilar length 51 ; zygomatic breadth 32 ; nasals 20·5 ; diastema 18·5 ; upper molar series 10·4.

Anderson included in his species specimens from Purneah, Sibsagar and even the Khasi Hills, but the first one of which details are recorded was a Calcutta specimen, and must be accepted as the type.

(5) *Bandicota indica*, Bechst.

1800. ***Mus indicus***, Bechst. Allgem. Uebers. vierfüss. Thiere, p. 713.
1800. ***Mus bandicota***, Bechst. Allgem. Uebers. vierfüss. Thiere, p. 714.
1801. ***Mus perchal***, Shaw. Gen. Zool. ii. p. 54.

Thomas, in his paper on the Indian Muridæ (P. Z. S. 1881, p. 528), recognized that Pennant's "Perchal Rat" and "Bandicote Rat" were the same thing, and this view has been universally accepted since. For these names Bechstein in his edition of Pennant's book substituted the Latin ones *indicus* and *bandicota*. By an oversight Thomas wrote "*bandicota* and *indicus*," and in this has been followed by other writers ; but, as will be seen from the references quoted above, *indica* is the older name and must stand for the species.

The type locality is Pondicherry. I unfortunately have been unable to examine any specimen from the east coast of Madras except an immature one from Nellore, but, allowing for age, I can find no great difference between it and two Nilgiri specimens. Accepting these as representing *indica*, that species is slightly smaller than *elliotana* on the one side and *malabarica* on the other.

The underfur has no markedly coloured tip as is usual in this genus, the basally whitish hairs merely becoming tinged with buffy in their distal half ; the result is a general drab coat overlaid on the back, and especially the rump, by a "mantle" of dark brown.

The skull, though not much smaller than that of *elliotana* and *malabarica* in over all measurements, is strikingly more delicately formed in all details : the bullæ are distinctly smaller.

Dimensions of an old female from Ootacamund are :—

Head and body 266 mm. ; tail 245 ; hind foot 51 ; ear 30.

Skull : greatest length 57 ; basilar length 50 ; zygomatic breadth 31·5 ; nasals 21·3 ; diastema 18·5 ; upper molar series 10.

Hab. Pondicherry.

(6) *Bandicota nemorivaga*, Hodgs.

1836. *Mus* (*Rattus*) *nemorivagus*, Hodgs. J. A. S. B. v. p. 234.

1845. *Mus macropus*, Hodgs. Ann. and Mag. Nat. Hist. xv. p. 268.

Two cotypes of Hodgson's *nemorivagus* and the type of his *macropus* are in the Museum Collection.

Size about as in *elliotana*.

The coat has the "mantle" of long hairs much less marked than in the larger forms (except *elliotana*). The general colour is a dull brown, the long hairs being merely a somewhat darker shade of the underfur amounting at most to.

Dimensions as recorded by Hodgson are :—

Head and body 300 mm. ; tail 240 ; hind foot 48 ; ear 31.

Skull : greatest length 59 ; basilar length 50 ; zygomatic breadth 32 ; nasals 21 ; diastema 19 ; upper molar series 10·5.

Hab. The type locality is Nepal.

The type of *Mus macropus* shows it to have been a quite young animal and as it was taken in the same locality as *nemorivaga* it is no doubt a young individual of that species.

Specimens from Tounghoo in Burma and Taiwan in Formosa show only small differences, though apparently both are smaller than *nemorivaga.* In the absence of material to show whether any or all of these differences are constant, it would be unjustifiable to separate them.

I cannot close this paper without calling the attention of members to the fact that there is in the National Collection not a single specimen of *Bandicota* from the Bombay Presidency, and consequently Guzerath, the Dekhan, Konkan, and Carnatic have had to be left out in the above notes on the genus.

IMPORTANT ADDITIONS TO THE INDIAN AVIFAUNA.

BY

E. C. STUART BAKER, F.L.S., F.Z.S.

THE CHINESE CRIMSON HORNED PHEASANT.

Tragopan temmincki.

Blanford.—Avifauna of British India, Vol. IV, p. 100. Catalogue British Museum, Vol. XXII, p. 275.

Two specimens of this magnificent pheasant which have been received by the Society from Capt. G. Elliot, of the 58th Rifles, are the first specimens obtained within British Indian limits.

They were shot by Mr. W. Scott, Civil Officer of the Sadon Hill Tracts, on the Panseng Pass at a height of 9,000 feet, longitude 98, latitude about 25. In the letter forwarding the skins to Bombay the following interesting notes are given.

Colours and soft parts.—"The bird had twohorns, each about 1¼ inch long of a light peacock blue colour and a pouch under his throat 3½ to 4 inches long of the same colour mottled over with reddish yellow spots about ¼ inch in diameter."

Call.—"One single, high note, not unlike a cat's mew."

In the catalogue of the British Museum Ogilvie-Grant gives the range of this pheasant as "South-West and Central China; ranging from the Mishmi Hills, through Sye-chuen to South Shen-si and Hoo-pee." Of the five skins in the possession of the Museum there is one of an adult male from the Mishmi Hills. The birds were shot at the end of March and it is remarkable that at that date the horns and pouch should have been at their full colour and size. I found that in its near relation, *Tragopan blythi*, Blyth's Crimson Horned Pheasant, of the Naga Hills, the size and colour of these parts did not fully develope until May or early June. Dr. R. Cran reported in "Stray Feathers" that he had obtained a specimen of Blyth's Tragopan from the Dafla Hills; these Hills adjoin the Mishmi Hills and it is practically certain that Dr. Cran's specimen must have belonged to the species now under notice.

Temminck's Tragopan appears to be extremely common on the Mishmi, Dafla and Abu Hills above 8,000 feet, and in the Mishmi Expedition of 1900 a great many were seen by the officers and men and some shot by the latter though I failed to obtain any skins. It approaches very close to British limits in Sadya, being found on the high ranges above, and only some 12 miles distant from, the border Police posts.

BEWICK'S SWAN.

Cygnus bewicki.

Salvadori—Catalogue of British Museum, XXVII, p. 29; Stuart Baker, Journal, Bombay Natural History Society, XI, p. 14; Blanford, *ibid.* p. 306.

When my articles on "Indian Ducks and their Allies" were commenced in this Journal, it will be remembered that on the strength of Humes' and Salvadori's identification of the head and feet of a swan in the British Museum this species was admitted by me as one of our Indian avifauna. Further investigation by Blanford however showed that these parts had undoubtedly belonged to a specimen of the Whooper Swan (*Cygnus musicus*) and Bewick's Swan had accordingly to be expunged from our list.

It is therefore extremely satisfactory to be able to record that an undoubted specimen of *Cygnus bewicki*, Bewick's Swan, has been shot by Mr. R. L. McCulloch of the Indian Police at Jacobabad in Sind.

The skin has been very kindly forwarded to me for identification, and I have no hesitation in describing it as a very fine adult specimen of the above swan. The whole plumage is perfectly pure white, there being no trace of grey or rusty on either upper or lower plumage, and we may therefore assume that the bird has reached its full dimensions and we can place full reliance on the measurements of bill and feet, the main determining factor in identification.

The comparative measurements of this specimen of Bewick's Swan is given with average measurements of the Whooper, *Cygnus musicus*, to show the difference—

	Wing.	Tarsus.	Bill from gape.	Culmen.
The Whooper ...	25″ to 26″	4·2″ to 4·5″	4″ to 4·2″	4·2″
Bewick's Swan ...	20·25″	3·75″	3·75″	3·8″

The exact measurements of the tarsus of this skin of Bewick's Swan are as follows:—

Tarsus at front from centre of ankle joint to toe 3·95″, at side 3·75″ and from behind to hallux 3·0″.

In the normal bill of the Whooper the black of the apical portion of the upper mandible does not extend half way up, or not more than half way up, and also does not extend along the commissure to the gape. In the present specimen of *bewicki* the black extends in mottling well beyond the nostrils both above and below; the edge of the forehead is black and the black of the commissure extends up to and round the gape, the whole of the lower mandible being black, an unusual feature even in *bewicki*.

In forwarding the skin to the Bombay Natural History Society Mr. McCulloch writes "shot by me here in Jacobabad on 2nd December 1907. This swan was by itself on a shallow piece of water in the centre of a piece of jungle. It had been there some ten days before I shot it."

ON THE FLORA OF CUTCH.

BY

E. BLATTER, S.J.

PART I.

The flora of Cutch has received very little attention on the part of botanical explorers. There is scarcely any other part in India that is so seldom mentioned in floristic works as Cutch. Much less are we able to find any special publication on its vegetation. When Hooker and Thomson published their "Flora Indica" in 1855, they gave us in the "Introductory Essay" a valuable account of the physical and botanical features of the various parts of India, but regarding Cutch we read only the following remarks: "The district of Kach, which is separated from Katiwar by the Gulf of Kach, a narrow arm of the sea, from Sindh by the most eastern branch of the Indus, and from Marwar by the Rann (a very singular saline and more or less marshy plain, in which the river Luni loses itself) has a very similar climate to the peninsula of Gujarat, being like that traversed by a range of hills running from West to East. It may, therefore, (for our purposes) with more propriety be considered a part of Gujarat, than to belong to Sindh, to which physically as well as politically it is more nearly related. The northern districts of both Kach and Katiwar, being screened from the rain-bringing winds by the hills, are extremely arid."[1] Since the time when this was written, the countries surrounding Cutch have been explored more minutely as regards their flora, and the physical and meteorological conditions prevailing in them are better known. This will enable us later on to decide the question whether Cutch ought to be considered a part of the botanical province of Gujarat or of Sind. The last 50 years did not add much to our knowledge of the flora of Cutch. Here we are speaking of the printed records only, for we are not so fortunate as to have access to the extensive herbaria of Europe which very likely contain specimens also of Cutch. Of the former only one came under our notice. It is a list of the plants of Cutch, prepared by Colonel C. T. Palin as a contribution to Vol. V. of the Bombay Gazetteer in 1880. The circumstance that the habitat and flowering time is added to the names of many species make the catalogue a very valuable one. It was just the fact, on the one hand, that the flora of Cutch is very incompletely known and, on the other, that Cutch occupies an almost isolated position, that induced me in December last, to pay a visit to that out-of-the-way country. If I am now able to add something to our previous knowledge of the Botany of Cutch, it is greatly due to the untiring efforts of my companion, the Rev. H. Sierp, S.J., Professor of Chemistry, who, with valuable suggestions and practical aid, was a great help to me throughout the whole journey.

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[1] **Hooker, J. D., and Thomson, T., Flora Indica, Vol. I., p. 150.**

As the physical aspects and meteorological conditions of a country determine the special character and development of its vegetation, it is advisable to give first a short sketch of the territory of Cutch. I consider this less superfluous because comparatively very few are personally acquainted with Cutch, and if others try to form an idea as to its physical configuration, I am afraid, the picture they draw of Cutch will not be accurate, not to say incorrect, if I am allowed to draw a conclusion from my own experiences.

The Province of Cutch extends from 20° 47′ to 24° N. Lat., and 68° 26′ to 71° 10′ E. Long., being crossed by the parallel of the tropic of cancer about 14 miles north of the capital, Bhuj. On the north, east, and south-east it is bounded by the Rann; on the south by the Gulf of Cutch, on the west by the Arabian Sea, and on the north-west by the eastern branch of the Indus. Its extreme length from east to west is 160 miles and its extreme breadth 70 from north to south, while in one place it is only 35 miles wide. It contains about 6,500 square miles, exclusive of the Grand Rann, which, including the islands with the portion bounded by the Gujarat Coast in the east and south-east covers an area of 10,000 square miles. Perhaps the most striking feature to the visitor of Cutch is the sterility of the country. Sandy plains and naked rocky hills present a strong contrast to the more fertile parts of India. The barrenness is increased by the scarcity of trees and general absence of anything that can be called jungle. "From the sea on the south and west, and from the Rann on the north and east, the coast of Cutch is in some places very slightly raised and fringed with mangrove swamps. In other parts it rises in rows of sand hills, or as in the north-west, in broken rocky cliffs. Inland, especially on the south and east, are broad plains, some deep soiled and well tilled, others bare and furrowed with water-courses. Beyond these plains rise the central lands of the province, in places relieved by bright coloured rocks and patches of tillage, but over most of the area brown waving uplands deep in loose sand, broken by naked peaks, and bordered by bare ridges of low dust-coloured hills."[1] Yet parts of the country are far from being unpicturesque. Though none of the elevations of Cutch are very great, being generally under 1,500 feet above the sea, its hills form one of the chief natural features of the Province. Three distinct ranges of hills are traceable in Cutch proper having an easterly and westerly direction. The most northern range overlooks the Rann from near Lukput to a point about 28 miles eastward of Bhuj. It forms an irregular chain, and, for the greater part, presents to the north a perpendicular cliff, and to the south an inclined plain. The next, called the Charwar range, passes transversely through the centre of the Province, and is connected with the former, at its north-western extremity, by a cluster of hills. It is made up, partly of sandstone, and partly of a series of strata of slate clay, limestone, slate, and slaty limestone. The third, or southern range, called the Dora hills, has the same general direction as the other two, but is of smaller extent and consists entirely of volcanic materials. A number of isolated volcanic hills are also scattered over the plain, as well as in other parts of the Province, particularly on the borders of the Rann, where is situated the hill Dhinodhar, the highest in Cutch (1,073 feet). The Vagad hills in the eastern part of the district, are a broad group stretching east and west. They have many separate peaks, the principal of which is the Vittroe. A disconnected chain traverses the Rann islands of Pacham, Kurreer, Bela, and Chorar from west to east. The most lofty summit occurs at Pacham Peer, rising 1,437 feet above the Rann. The varied and vivid colouring of the rocks add a peculiar charm to the aspect of the country. The three primary colours with many varieties of their compounds are represented by the rocks as well as their atmospheric debris. "Owing to the oxides of iron, red and yellow prevail; but in some places these are mixed with pale lavender, blue and purple tints, and contrasted with intense black or the purest white; and when any vegetation adds some green, the brilliancy of the effect becomes very striking. As a rule, the country has warm sienna tints, with red, purple or black rocks nearly always close at hand; while the grey, purple or orange hills are often varied by patches of white strongly relieved against the adjacent sombre colour of some mass of intrusive or overlying trap."[1]

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[1] Bombay Gazetteer, Vol. v., p. 2.

There are no rivers that have water enough to flow throughout the year. The river courses are merely channels for conveying the periodical floods from the central uplands to the sea and Rann respectively. The Khari, which rises in the Chorad hills, about eight miles south-west of Bhuj, has a course of about 30 miles. Flowing past Bhuj and winding its way between steep banks in places 110 feet high, it keeps north and loses itself in the Rann. The largest rivers that have a southern direction are the Madh and the Tera. They flow for about 30 miles across the Abdasa plain and fall together into the Gulf of Cutch. Owing to the fact that almost all the rocks are impregnated with salts, the water of the Cutch streams is unfit to drink, and during the hot season is too salt even for cattle. This circumstance has to do a great deal with the character of the present flora. Water is usually found at no great depth from the surface. Many wells being 15 to 45 feet deep yield sufficient supplies. The ponds, which are not uncommon, are mostly small and usually run dry in six months.[2]

As to the climate of Cutch we have to rely almost entirely on general and insufficient data scattered here and there in various descriptions of that Province[3]. Being situated along the north parallel of the tropic of Cancer, Cutch is very little subjected to the rain—bringing influence of the south-west monsoon. Though heavy monsoon rains are experienced on the western shores and side of India far to the north of Ahmedabad, they seem to neglect the southern parts of Sind and Kattiawar. The 21 years preceding 1869 show an average annual rainfall of 14·30 inches at Bhuj, the maximum registered being 34·88 inches in 1862, and the minimum 1·10 in 1848. The rain generally reaches Cutch from directions opposite to that of the prevailing winds, in the form of squalls from the north-north-west round by north and east, to south. The south-west monsoon winds are very strong from June to October, the weather being seldom calm. In the cold months harsh east and north winds prevail, succeeded by strong south-westerly gales and steady winds, the air being frequently loaded with dust. The months of April and May are very hot inland, while along the coast the climate is delightful, from the absence of the burning winds and dust storms that prevail elsewhere during those months. In June the hot winds generally cease; the atmosphere becomes cloudy; and occasionally the rains, which commence very irregularly, are preceded by excessive sultriness. During the rains the climate is usually most agreeable: cloudy and cool, with a cool breeze night and day. The cold weather sets in later in Cutch than in Gujarat. The sun during the first half of November is oppressively hot; December is cold; and January colder. In this month ice is occasionally produced. In March, again, the sun begins to strike hot.

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[1] Memoirs of the Geological Survey of India, vol. IX., p. 14.

[2] For further information regarding the physical geography of Cutch we refer to—

MacMurdo, J.—An account of the province of Kutch and of the countries lying between Guzerat and the Indus in "Transactions of the Literary Society of Bombay, Vol. II," 1820.

Grant, C. W.—Memoirs to illustrate a geological map of Kutch in "Geological Papers on Western India" by Carter, 1857.

Raikes, S. N.—Memoir on the Kutch State, 1854.

Records of the Geological Survey of India, Vol. II, parts 2 and 3, 1869.

Wynne, A. B.—Memoir on the Geology of Cutch in "Memoirs of the Geological Survey of India," Vol. IX, 1872.

[3] cf. Raikes, S. N, l. c.

Raikes, N. S.—Brief notes relative to the Kutch State, 1854.

Burnes, J.—General remarks on the medical topography of Bhooj, 1828.

Wynne, A. B., l. c.

Bombay Gazetteer, Vol. V.

Through the kindness of Dr. P. J. Figueredo, who is in charge of the meteorological station at Bhuj, I am able to give a few tables regarding the rainfall and temperature in that place. We can only regret that similar observations are not made in other places of the province, as it is very probable that distinct differences exist in the plains north and south of the hill ranges. The differences will, however, not be very great, and the subjoined data are likely to give a fair idea of the climate of the whole of Cutch.

Bhuj Rainfall, 1904-1907, at N. Lat. 23°15′, and E. Long. 69°49′.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1904	0·14	..	0·68	..	..	..	1·65	0·28	2·17	..	0·40	..	5·32
1905	0·16	..	..	0·02	..	..	4·76	0·82	0·72	..	..	..	6·48
1906	0·09	1·44	..	..	..	4·43	4·66	2·33	3·43	1·50	..	..	17·88
1907	..	1·17	..	0·01	..	2·90	5·41	6·07	0·17	..	..	..	15·73

Bhuj Thermometer Readings in 1904, showing the Mean Monthly Maxima and Minima with Mean Daily Range.

January.			February.			March.			April.			May.			June.		
Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range	Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.
79	54	25	86	59	27	89	65	24	100	70	30	101	71	30	96	80	16

July.			August.			September.			October.			November.			December.		
Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.
90	77	13	92	74	18	93	74	19	97	73	24	90	68	22	82	65	17

Of the two factors, rain and temperature, the latter seems to exercise very little modifying influence upon the seasons in the vegetative and sexual life of the plants. It is mainly the water that awakens the slumbering seeds from their dry and apparently lifeless grave; and if the country is barren and devoid of forests and jungle, we shall find the cause of it in the want of rain. This becomes evident from the fact that, when even a little rain falls, grasses and herbs quickly spring up, and that plains and hills rapidly change colour, especially in the trappean area. If cloudy weather follows, sufficient pasture is obtained for the herds upon which the inhabitants mainly depend for their subsistence. On the other hand, in ordinary dry seasons the plains resemble deserts. Heavy sand is drifted over them by the wind often into forms imitating the dunes of sea coasts, and the country seems to afford nourishment to little besides numbers of prickly Euphorbias. In cases where the rains are so partial that large tracts receive but a few scanty showers for several years in succession, the country becomes all but uninhabited, the people with their flocks being forced to look out for subsistence on the irrigated lands of Sind or elsewhere.

The soil of Cutch is, generally speaking, a light clay, covered with a coarse sand from one to four and six inches deep. Six or eight feet below the surface, in many places is found a clay of perfectly white colour like lime, and in others we meet with a strong tough yellow clay mixed with small stones. In the former water is said to be found most abundant, but not of the best quality; and in the latter, water of an excellent quality is generally got by penetrating through a thin bed of rock lying beneath it. In some of the plains near the hills excellent water is found by cutting through a sandstone which often lies within four feet of the surface ; and in other plains wells have been sunk sixty or seventy feet deep without meeting with either water or stone of any kind. In Vagad the soil is more loamy than in any other part of Cutch: and in many instances under the hills throughout the province we meet with a rich soil thickly covered with a coarse kind of gravel, which seems in some way or other to aid vegetation. Extensive salt wastes, which are not uncommon, are frequently encrusted with a saline covering, and yield no vegetation.

The following list contains the indigenous plants as well as those commonly cultivated. No mention is made of the numerous species introduced into the splendid gardens of H. H. the Rao of Cutch and of the Political Agent residing in Bhuj. The geographical distribution[1] has been added to each species in order to facilitate the formation of a general idea as to the origin and composition of the flora and its present relations to the vegetation of the neighbouring countries.

In this place I should like to express my sincerest thanks to H. H. the Rao of Cutch, to Col. Abud, the Political Agent, to the Dewan Saheb, Mr. Chunilal Sarabhai, and to Mr. R. H. Kotwal, the Commissioner of Police, for the kind assistance they gave us throughout our stay in Cutch.

1. *Magnoliaceæ*—
   (1) Michelia champaca, L.—Cultivated ; flowers: Apr.-Sept.—Java.
2. *Anonaceæ*—
   (2) Polyalthia longifolia, Benth and Hook.—Not indigenous; flowers Apr.-May—Ceylon.
   (3) Anona squamosa, L.—Cultivated.—West Indies.
   (4) Anona reticulata, L.—Cultivated.—West Indies.
3. *Menispermaceæ*—
   (5) Tinospora cordifolia, Miers—Konkan, Deccan, S. M. Country.

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[1] The respective notes have been gathered from the more recent floristic works on Indian plants, especially Th. Cooke and J. D. Hooker.

(6) Cocculus villosus, DC.—Not common; flowers: Dec.—Gujarat, Deccan, Konkan.

(7) Cocculus leæba, DC.—Rare; flowers: Nov.-Dec.—Sind, Gujarat—Afghanistan, Arabia, Africa.

(8) Stephania hernandifolia, Walp.—Rare—Deccan, Konkan, Kanara—Malaya, Tropical Africa and Australia.

4. *Nymphæaceæ*—

(9) Nymphæa lotus, L.—Very rare; cultivated in the Bombay Presidency—Africa, Hungary, Java, Philippines.

(10) Nymphæa stellata, Willd.—Rare; cultivated in the Bombay Presidency—Africa.

5. *Fumariaceæ*—

(11) Fumaria parviflora, Lam.—In cultivated fields; flowers: Dec.-Jan.—Sind, Deccan.

6. *Cruciferæ*—

(12) Farsetia jacquemontii, Hook. f. and Thoms.—Pretty common; flowers: Dec.—Sind, N. India—Afghanistan, Beluchistan.

(13) Moricandia tortuosa, Hook. f. and Thoms.—Rare; flowers: Dec.—Sind.

7. *Capparidaceæ*—

(14) Cleome monophylla, L.—Rare; flowers: Nov.-Dec.—Gujarat, Deccan, S. M. Country—Tropical Africa.

(15) Cleome papillosa, Steud.—Flowers: August-Dec.—Sind—Arabia, Abyssinia, Nubia, Kordofan.

(16) Cleome stocksiana, Boiss.—Flowers: Oct.-Nov.—Sind—Beluchistan.

(17) Cleome brachycarpa, Vahl.—Flowers: Nov.-May.—Sind.—Arabia, N. Africa.

(18) Gynandropsis pentaphylla, DC.—Common in waste places; flowers: June-Sept.—Gujarat, Deccan, S. M. Country.

(19) Mærua ovalifolia, Cambess.—Rare, in hedges; flowers: Nov.-March.—Gujarat, Deccan, Konkan, S. M. Country.

(20) Cadaba indica, Lam.—Rare, in hedges; flowers: Nov.-March—Gujarat, Deccan, Konkan, S. M. Country.

(21) Capparis spinosa, L.—Not common; flowers: Dec.-March.—Sind, Deccan, Konkan—N. Africa, Mediterranean region of Europe, Australia.

(22) Capparis spinosa, L., var. galeata, Hook., f. and Thoms.—Sind.—Arabia, E. Africa.

(23) Capparis aphylla, Roth.—Very common; flowers: Feb.-March.—Sind, Gujarat, Deccan—Arabia, N. Tropical Africa, Egypt.

(24) Capparis sepiaria, L.—Rare; flowers: Feb.-March.—Deccan, Kanara.

(25) Capparis horrida, L. f.—Not common; flowers: Nov.-Apr.—Sind, Deccan, Konkan, S. M. Country.

8. *Resedaceæ*—
   (26) Reseda pruinosa, Delile.—Rare.—Flowers: March.—Sind.
   (27) Reseda aucheri, Boiss.—Rare.—Sind.
9. *Violaceæ*—
   (28) Viola stocksii, Boiss.—Flowers: July-August.—Sind, Gujarat—Beluchistan, Afghanistan.
10. *Polygalaceæ*—
   (29) Polygala erioptera, DC.—On dry cultivated ground.—Sind, Gujarat, Deccan, Konkan—Tropical Asia and Africa.
   (30) Polygala elongata, Klein.—On sandy cultivated ground; flowers: Aug.-Dec.—Konkan, Kanara, S. M. Country.
   (31) Polygala irregularis, Boiss.—On sandy tilled soil; flowers: Dec.—Sind, Gujarat—Beluchistan, Arabia, Kordofan.
11. *Caryophyllaceæ*—
   (32) Polycarpæa corymbosa, Lam.—On sandy ground; flowers: Nov.-Feb.—Sind, Deccan, Konkan, S. M. Country—Tropical Asia, Africa, America, Australia.
   (33) Polycarpæa spicata, Wight.—On sandy soil; flowers: Nov.-Feb.—Sind, Gujarat—Arabia, Abyssinia, Egypt.
12. *Portulacaceæ*—
   (34) Portulaca oleracea, L.—A pretty common weed; flowers: Sept.-Jan.—Throughout the Presidency.
   (35) Portulaca quadrifida, L.—Common; flowers: Sept.-Jan.—Sind, Deccan, S. M. Country.
   (36) Portulaca tuberosa, Roxb.—On sandy soil, less common than the foregoing species: flowers: Aug.-Sept.—Sind.
13. *Tamaricaceæ*—
   (37) Tamarix dioica, Roxb.—In river beds; flowers: Nov.-Dec.—Throughout the Presidency—Afghanistan, Assam, Borneo.
   (38) Tamarix ericoides, Rottl.—Rarer than T dioica; flowers: Nov.-Jan.—Sind, Gujarat, Deccan, Konkan, Kanara.
14. *Elatinaceæ*—
   (39) Bergia odorata, Edgew.—Flowers: Oct.-Dec.—Sind, Gujarat.
15. *Malvaceæ*—
   (40) Althæa ludwigii, L.—Sind, Deccan—W. Asia, Mediterranean region, S. Africa.
   (41) Malva parviflora, L.—About human habitations; flowers: Dec.-Feb.—Sind, Deccan—W. Asia, N. Africa, Europe.
   (42) Sida veronicifolia, Lam.—Very common on sandy soil; flowers: Oct.-Dec.—Sind, Gujarat, Konkan, S. M. Country.—Tropical and subtropical regions of the world.
   (43) Sida spinosa, L.—Flowers: Oct.-Dec.—Sind, Gujarat, Deccan, Konkan—Tropical and subtropical regions of the world.

(44) Sida rhombifolia, var. retusa, Masters.—Very common; flowers: Oct.-Jan.—Gujarat, Deccan, Konkan, S. M. Country.

(45) Abutilon indicum, Sweet.—Very common; flowers: Oct.-Jan.—Sind, Deccan, Konkan, S. M. Country.

(46) Abutilon muticum, Sweet.—Common: flowers: Sept.-Jan.—Throughout the Presidency.

(47) Abutilon graveolens, W. & A.—Not common; flowers: Nov.-Jan.—Sind—From tropical Africa to Queensland.

(48) Malachra capitata, L.—Flowers: Sept.-Dec.—Naturalized in many places in India.

(49) Urena sinuata, L.—Flowers: Oct.-Dec.—Gujarat, Deccan, S. M. Country—All tropical regions.

(50) Pavonia glechomifolia, Garcke.—In sheltered places, under hedges and bushes: flowers: Sept.-Oct.—Sind, Gujarat—Arabia, Tropical Africa.

(51) Pavonia zeylanica, Cav.—Common; flowers: Sept.-Jan.—Sind, Gujarat, Deccan—Tropical Africa, Mauritius, Ceylon.

(52) Pavonia odorata, Willd.—Common; flowers: Sept.-Jan.—Konkan, S. M. Country—Tropical Africa, Ceylon.

(53) Hibiscus trionum, L.—Flowers: Sept.-Jan.—Sind, Deccan, Konkan—Southern Europe, Tropics of the Old World.

(54) Hibiscus micranthus, L.—Common: flowers: Oct.-Nov.—Sind, Gujarat, Deccan, Konkan, S. M. Country—Tropical Africa, Ceylon.

(55) Hibiscus intermedius, A. Rich.—Common; flowers: Aug.-Oct.—Sind, Gujarat—Arabia, Tropical Africa.

(56) Hibiscus solandra, L'Hér.—Flowers: Oct.-Dec.—Gujarat, Konkan, S. M. Country.—Asia, tropical Africa.

(57) Hibiscus cæsius, Garcke.—Flowers: Oct.-Nov.—Deccan—Afghanistan, N. Australia, S. Africa.

(58) Hibiscus punctatus, Dalz.—Flowers: Sept.-Jan.

(59) Hibiscus esculentus, L.—Cultivated.

(60) Thespesia populnea, Poland.—Not wild; flowers: Nov.-Jan.

(61) Gossypium stocksii, Mast.—Flowers: Dec.-Jan.—Sind.

(62) Gossypium herbaceum, L. var.

(63) Gossypium arboreum, L.

16. *Sterculiaceæ*—

(64) Melhania tomentosa, Stocks.—Gujarat, Sind.

(64a.) Waltheria indica, L.—Not common; flowers: Sept.-Oct.—Deccan, S. M. Country.—Warmer regions of the world.

17. *Tiliaceæ*.—

(65) Grewia populifolia, Vahl.—Common; flowers: Sept.-Nov.—Sind, S. M. Country—Beluchistan, Afghanistan, S. Persia, Arabia, Tropical Africa, Mauritius, Ceylon.

(66) Grewia villosa, Willd.—Common—Sind, Gujarat, Deccan, Konkan.

(67) Triumfetta rhomboidea, Jacquin.—Common ; flowers: Sept.-Jan.—Deccan, Konkan, S. M. Country, Kanara—China, Malaya, Tropical Africa.

(68) Triumfetta rotundifolia, Lam.—Common ; flowers: Aug.-Sept.—Gujarat, Deccan, Konkan.

(69) Corchorus olitorius, L.—Common ; flowers: Sept.—Sind, Gujarat Deccan, Konkan, S. M. Country—All tropical regions.

(70) Corchorus antichorus, Raensch.—Common ; flowers: Sept.-Nov.—Sind, Gujarat, Deccan—Afghanistan, Arabia, Tropical Africa, Cape de Verde Islands.

(71) Corchorus acutangulus, Lam.—Flowers: Sept.-Oct.—Sind, Gujarat, Konkan—Ceylon.

18. *Malpighiaceæ*—

(72) Hiptage madablota, Gærtn.[1]—Deccan, Konkan, Kanara—Ceylon, Java, China.

19. *Zygophyllaceæ*.—

(73) Tribulus terrestris, L.—Common ; flowers: Aug.-Oct.—Sind, Gujarat, Deccan, S. M. Country.

(74) Tribulus alatus, Delile.—Flowers: Oct.-Dec.—Sind—Arabia, N. Africa.

(75) Seetzenia orientalis, Dcne.—Sind—Arabia, Africa.

(76) Peganum harmala, L.—Flowers: Nov.-Dec.—Sind, Deccan, Konkan—Soongaria, Arabia, N. Africa, Hungary, Spain.

(77) Zygophyllum simplex, L.—Flowers: Nov.-Jan.—Sind—Arabia, Western Asia, Tropical Africa.

(78) Fagonia cretica, L.—Very common ; flowers: Oct.-Jan.—Sind, Deccan.

20. *Geraniaceæ*.—

(79) Monsonia senegalensis, Guill.—Pretty common ; flowers: Aug.-Oct.—Sind, Gujarat, Deccan—Beluchistan, Arabia, Senegambia.

(80) Oxalis corniculata, L.—Flowers: Oct.-June—Cosmopolitan.

21. *Rutaceæ*—

(81) Murraya kœnigii, Spreng.—In gardens—Deccan, Konkan, Kanara, S. M. Country—Ceylon.

(82) Citrus medica, L., var. medica, Citron.—In gardens.

(83) „ „ L., var. limetta, Sweet Lime—In gardens.

(84) „ „ L., var. acida, Sour Lime.—In gardens.

(85) Citrus aurantium, L.—Orange. In gardens.

(86) Citrus decumana, Murr.—Pammelo. In gardens.

(87) Feronia elephantum, Corr.—In gardens—Java, Ceylon.

22. *Simarubaceæ*—

(88) Balanites roxburghii, Planch.—Common ; flowers: March-May—Gujarat, Deccan, Konkan, S. M. Country—Drier parts of India.

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[1] I have not seen this plant; I give it on the authority of Murray.

23. *Burseraceæ.*—

(89) Commiphora mukul, Engl.— Pretty common on rocky ground; flowers: Dec.-April.—Sind, Deccan, Rajputana, Arabia, Beluchistan.

24. *Meliaceæ.*—

(90) Melia azedarach, L.—In gardens—Persia, China.

(91) Azadirachta indica, A. Juss.—In gardens.

25. *Celastraceæ.*—

(92) Gymnosporia montana, Benth.—On rocky ground, not common; flowers: Oct.-Nov.—Sind, Gujarat, Deccan, Konkan, Kanara—Central, South-western and North-western parts of India, Afghanistan, Central Africa, Malaya, Australia.

26. *Rhamnaceæ.*—

(93) Zizyphus jujuba, Lamk.—Very common; flowers: Sept.-Oct.—Throughout India.—Afghanistan, Ceylon, China, Australia, Africa.

(94) Zizyphus rotundifolia, Lamk.—Not common; flowers: Sept.-Oct.—Gujarat, S. M. Country, Punjab, Western Peninsula, Persia.

(95) Zizyphus œnoplia, Mill.—Not common; flowers: Sept.-Oct.—Deccan Konkan, Kanara, S. M. Country—Hotter parts of India, Tropical Asia, Australia.

27. *Vitaceæ.*—

(96) Vitis trifolia, L.—Not common; flowers: Aug.—Deccan, Konkan, Kanara, S. M. Country—throughout India, Ceylon, Malacca.

28. *Sapindaceæ.*—

(97) Sapindus laurifolius, Vahl.—Cultivated; flowers: Oct.-Dec.—Indigenous in N. Kanara.

29. *Anacardiaceæ.*

(98) Rhus mysorensis, Heyne.—Not common, on stony dry slopes; flowers: June-July—Sind, Deccan, S. M. Country—Throughout India.

(99) Mangifera indica, L.—Cultivated; flowers: Jan.-March.

30. *Moringaceæ.*—

(100) Moringa pterygosperma, Gærtn.—Cultivated, near villages in tilled soil—Indigenous on the W. Himalaya and in Oudh.

31. *Leguminosæ.*—

(101) Crotalaria burhia, Ham.—Common in sandy places; flowers: Dec. Feb.—Sind, Gujarat—N. W. India, Afghanistan, Beluchistan.

(102) Crotalaria retusa, L.—Common; flowers: Sep.-Jan.—Deccan, Konkan, S. M. Country—Throughout India, Ceylon, China, Malaya, N. Australia, Tropical Africa.

(103) Crotal jariauncea, L.—Common; flowers: Aug.-Jan.—Malay Islands, Australia.

(104) Crotalaria medicaginea, Lam., var. neglecta, Baker.—Sind, Gujarat, Konkan—Tropical India, Ceylon, Malaya, Afghanistan, China, Australia.

(105) Crotalaria notonii, W. and A.—On sandy soil—Gujarat, Nilghiri and Pulney Hills.

(106) Melilotus indica, All.—Sind, Deccan—Tropical India, Europe; S. Persia, Afghanistan.

(107) Medicago sativa, L.—Cultivated.

(108) Lotus garcini, DC.—Flowers: Nov.-Dec.—Sind, Gujarat—Persia, Nubia.

(109) Indigofera linifolia, Retz.—Common; flowers: Aug.-Dec.—Deccan, Konkan, S. M. Country—Throughout India, Ceylon, Afghanistan, Abyssinia, N. Australia.

(110) Indigofera enneaphylla, L.—Common; flowers: Aug.-Dec.—Gujarat, Deccan, Konkan, S. M. Country—Plains of India, Ceylon, Angola, Malay Islands, N. Australia.

(111) Indigofera anabaptista, Steud.—Flowers: Aug.-Nov.—Sind—Punjab, Afghanistan, Arabia.

(112) Indigofera paucifolia, Delile.—Common; flowers: All the year—Gujarat, Sind—Plains of India, Ceylon, Beluchistan, Arabia, Java, Tropical Africa.

(113) Indigofera trifoliata, L.—Not common; flowers: Sept.-Nov.—Gujarat, Deccan, S. M. Country, Konkan—Throughout India, Ceylon, Java, China, Philippines, N. Australia.

(114) Indigofera articulata, Goüan.—Flowers: Nov.-Dec.—Sind, Deccan—Arabia, Egypt, Abyssinia.

(115) Indigofera tenuifolia, Rottl.—Flowers: Oct.-Nov.—Sind, Gujarat, S. M. Country, Konkan—Western Peninsula, Ceylon.

(116) Indigofera parviflora, Heyne.—Rare; Flowers: Nov.-Dec. -Konkan, S. M. Country—Western Peninsula, Carnatic, Arabia, Tropical Africa, N. Australia.

(117) Indigofera tinctoria, L.—Not common; flowers: Sept.-Dec.

(118) Indigofera hirsuta, L.—Not common; flowers: Sept.-Dec.—Konkan, S. M. Country—Plains of India—Ceylon, Tropical Africa and America, Java, Philippines, N. Australia.

(119) Tephrosia tenuis, Wall.—Flowers: Sept.-Nov.—Sind, Deccan, Konkan, S. M. Country—Punjab, Burma, Laccadives.

(120) Tephrosia purpurea, Pers.—In sandy places; flowers: Sept.-Dec.—Gujarat, Deccan, Konkan, S. M. Country.

(121) Tephrosia villosa, Pers.—var. incana, Baker; Common in sandy places; flowers: Sept.-Dec.—Gujarat, S. M. Country.

(122) Tephrosia senticosa, Pers.—In sandy places; flowers: Sept.-Dec.—Deccan, Konkan, Western Peninsula—Burma, Ceylon.

(123) Sesbania ægyptiaca, Poir. var. bicolor, W. and A.—Flowers: Sept.-Dec.

(124) Sesbania aculeata, Poir.—Very common; flowers: Aug.-Oct.—Konkan, Deccan—Tropics of the Old World.

(125) Taverniera nummularia, DC.—Flowers: Dec.—Sind, Gujarat, Deccan—Punjab, Afghanistan.

(126) Alhagi camelorum. Fisch. —Not common; flowers: March.—Sind, Gujarat, S. M. Country, N. and N.-W. Provinces—Beluchistan, Egypt, Arabia.

(127) Zornia diphylla, Pers.—Very common; flowers: Aug.-Oct.—Deccan, S. M. Country.

(128) Alysicarpus vaginalis, DC. flowers: Oct.-Nov.—Gujarat, Deccan, Konkan, throughout India—Ceylon, Afghanistan, Tropics of the Old World.

(129) Alysicarpus longifolius, W. and A.—flowers: Sept.—Gujarat, Deccan, Konkan, Plains of India.

(130) Alysicarpus rugosus, DC. var. styracifolius, Baker—Sind, Gujarat Konkan, throughout India—Ceylon.

(131) Abrus precatorius, L.—Not common; flowers: Sept.-Oct.—Gujarat, Deccan, Konkan, Kanara.—India, Ceylon, throughout the Tropics.

(132) Butea frondosa, Koenig.—Rare; flowers: Feb.-March.—Gujarat, Deccan, Konkan—India, Ceylon.

(133) Phaseolus trilobus, Ait.—Flowers: Oct.-Nov.—Sind, Gujarat, Deccan, Konkan.

(134) Phaseolus vulgaris, L.—Cultivated—S. America.

(135) Phaseolus mungo, L., var. roxburghii, Prain—Cultivated in the rainy season.

(136) Phaseolus aconitifolius, Jacquin.—Cultivated in the rainy season.

(137) Clitoria ternatea, L.—Common in hedges; flowers: Aug.-Nov.—Generally in the Tropics.

(138) Dolichos lablab, L.—Cultivated—Tropics of the Old World.

(139) Rhynchosia minima, DC.—Common in hedges—flowers: Aug.-Jan.—Sind, Gujarat, Deccan, Konkan, S. M. Country, India—Ceylon, throughout the Tropics, Cape, United States.

(140) Pongamia glabra, Vent.—Planted.

(141) Cajanus indicus, Spreng.—Cultivated—Tropical Africa.

(142) Cicer arietinum, L.—Very little grown. Cold weather.

(143) Cæsalpinia bonducella, Fleming.—Not common; flowers: Aug.-Sept.—Sind, Deccan, Kanara—India, throughout the Tropics.

(144) Cæsalpinia pulcherrima, Swartz.—Cultivated.

(145) Poinciana elata, L.—Planted.

(146) Poinciana regia, Bojer.—Planted.—Madagascar.

(147) Parkinsonia aculeata, L.—Naturalized—Tropical America.

(148) Cassia occidentalis, L.—Not common; flowers: Aug.-Oct.—Throughout India and the Tropics.

(149) Cassia sophora, L.—Not common; flowers: Aug.-Nov.—India, most Tropical Countries.

(150) Cassia tora, L.—Not common; flowers: Sept.-Dec.—India, generally throughout the Tropics.

(151) Cassia auriculata, L.—Gujarat, Deccan, Konkan, S. M. Country, Western Peninsula, Central Provinces—Ceylon.

(152) Cassia obtusa, Roxb.—Not common; flowers: Nov.-Feb.—Sind, Gujarat, Deccan, S. M. Country.

(153) Cassia holosericea, Fresen.—Flowers: Nov.-Jan.—Sind—Arabia, Tropical Africa.

(154) Cassia pumila, Lamk.—Very common; flowers: Aug.-Sept.—Deccan, S. M. Country, Kanara.—Tropical Asia and Australia.

(155) Tamarindus indica, L.—Not common, about villages, cultivated.

(156) Bauhinia racemosa, Lamk.—Rare; flowers: March-June—Deccan, Konkan, India—Ceylon, China, Timor.

(157) Prosopis spicigera, L.—Very common; flowers: Dec.-March—Sind, Gujarat, India—Beluchistan, Afghanistan, Persia.

(158) Dichrostachys cinerea, W. and A.—Rare, on dry stony ground; flowers: Oct.-Nov.—Deccan, S. M. Country, Kanara, India—Ceylon, Malay Islands, N. Australia.

(159) Mimosa rubicaulis, Lamk.—Flowers: Sept.-Nov.—Sind, Deccan, throughout India, Afghanistan.

(160) Mimosa hamata, Willd.—Common; flowers: Sept.-Oct.—Gujarat, Deccan, Konkan, S. M. Country, Western Peninsula.

(161) Acacia arabica, Willd.—Very common; flowers: July-Feb.—India—Ceylon, Arabia, Egypt, Tropical Africa, Natal.

(162) Acacia farnesiana, Willd.—Not indigenous; flowers: Sept.-March—Sind, Deccan, throughout the Tropics.

(163) Acacia eburnea, Willd.—Pretty common; flowers: Nov.-Feb.—Sind, S. M. Country, India—Ceylon, Arabia, Afghanistan.

(164) Acacia jacquemonti, Benth.—Rare; flowers: Jan.-May—Sind, Gujarat, Punjab, Rajputana.

(165) Acacia leucophlœa, Willd.—Common; flowers: Dec.-Feb.—Deccan, S. M. Country.

(166) Acacia catechu, Willd., var. sundra Prain.—Pretty common in bushy localities—Gujarat, Deccan, Konkan, S. M. Country.

(167) Albizzia lebbek, Benth.—Planted in gardens and near wells; flowers: March-May—Tropical and subtropical Asia and Africa.

32. *Rosaceæ.*—

(168) Potentilla supina, L.—Flowers: Oct.-Nov.—Sind, Gujarat, India—Afghanistan, Atlantic, N. Africa, N. Asia.

33. *Saxifragaceæ.*—

(169) Vahlia viscosa, Roxb.—Flowers: Dec.-Jan.—Sind, Gujarat, Konkan, India—Persia, Egypt, Tropical Africa.

34. *Haloragidaceæ*—

(170) Myriophyllum intermedium, DC.—In ponds—Deccan, S. M. Country, Kanara, Western Peninsula—Malaya, Australia, New Zealand, S. America.

35. *Rhizophoraceæ*—

(171) Rhizophora mucronata, Lamk.—In salt-marshes and tidal creeks; flowers: Aug.-Jan.—From Sind to Kanara—Tropics of the Old World and Australia.

(172) Rhizophora conjugata, L.—Less common than the foregoing species, in the same localities; flowers: Aug.-Jan.

(173) Brugniera gymnorhiza, Lamk.—In salt marshes along the coast.

36. *Myrtaceæ.*—

(174) Eugenia jambolana, Lamk.—In gardens and near wells; flowers: March-May—Throughout the Presidency, but not in Sind, India generally—Ceylon, Malaya, Australia.

(175) Psidium guyava, L.—Cultivated—Mexico.

37. *Lythraceæ*—

(176) Ammannia baccifera, L.—Flowers: Nov.-Dec.—Sind, Gujarat, Deccan, Kanara, Konkan, India—Ceylon, Afghanistan, Malaya, China, Australia, Tropical Africa.

(177) Ammannia salicifolia, Monti.—Flowers: Nov.—Sind, Deccan, S. M. Country, Konkan, throughout India—Tropical Africa.

(178) Lawsonia inermis, L.—Growing wild and cultivated.

(179) Punica granatum, L.—Cultivated—Wild in Persia, Beluchistan, Afghanistan.

38. *Cucurbitaceæ*—

(180) Trichosanthes anguina, L.—Cultivated.

(181) Momordica charantia, L.—Cultivated. Sind, Deccan, throughout India—Ceylon, Malaya, China, Tropical Africa.

(182) Momordica balsamina, L.—Flowers: Nov.-Dec.—Sind, Deccan, Gujurat, Panjab, N.-W. Provinces—Malaya, Australia, W. Asia, Africa.

(183) Luffa ægyptiaca, Mill.—In gardens.

(184) Luffa echinata, Roxb.—Flowers: Sept.-Oct.—Sind, Gujarat—Tropical Africa.

(185) Cucumis trigonus, Roxb.—Common; flowers: Aug.-Dec.—Sind, Deccan, all over India—Ceylon, Afghanistan, Persia, Malaya, N. Australia.

(186) Cucumis melo, L.—Cultivated—Probably indigenous in N.-W. India, Beluchistan and Tropical Africa.

(187) Cucumis melo, L., var. agrestis, Naud.—Common—Sind, Deccan S. M. Country.

188) Bryonopsis laciniosa, Naud.—Not common, in hedges; flowers

Aug.-Oct.—Deccan, S. M. Country, throughout India—Ceylon, Tropical Africa, Mauritius, Malaya, Australia.

(189) Citrullus colocynthis, Schrader.—Pretty common on sandy ground —Sind, Gujarat, Deccan, Konkan, all over India—Ceylon, Arabia, W. Asia, Africa, Spain.

(190) Citrullus vulgaris, Schrad.—Cultivated—Wild in Tropical Africa.

(191) Coccinia indica, W. and A.—Very common in hedges; flowers: Almost throughout the whole year—Sind, Gujarat, S. M. Country, Deccan, all over India—Ceylon, Malaya, Tropical Africa.

(192) Melothria maderaspatana, Cogniaux.—Common inh edges and bushes—Sind, Gujarat, Deccan, Konkan, S. M. Country, all over India—Ceylon, Africa, Malaya, Australia.

(193) Blastania garcini, Cogniaux.—Not common; flowers: Oct.-Nov.—Deccan, Gujarat, S. M. Country.

(194) Corallocarpus epigæus, C. B. Clarke—Pretty common—Sind, Gujarat, Deccan, S. M. Country, Punjab, Western Peninsula—Ceylon.

(195) Lagenaria vulgaris, Seringe.—Cultivated.—Wild in Malabar, Dehra Doon —Abyssinia, Moluccas.

(196) Cucurbita moschata, Duchesne.—Cultivated.

(197) Cucurbita maxima, Duchesne.—Cultivated.

(198) Cucurbita pepo, L.—Cultivated.

39. *Cactaceæ*—

(199) Opuntia dillenii, Haw.—Not common; used for hedges.

40. *Ficoideæ*—

(200) Trianthema monogyna, L.—Very common; Sind, Deccan, all over India—Ceylon, most Tropical Countries.

(201) Trianthema triquetra, Rottl. & Willd.—Very common; flowers Sept.-Nov.—Sind, Gujarat, Deccan, S. M. Country, Konkan, Punjab, W. Peninsula—Ceylon.

(202) Trianthema pentandra, L.—Common; flowers: Oct.-Dec.—Sind, Deccan, S. M. Country, Konkan, Punjab, N.-W. Provinces, W. Peninsula—Tropical Africa.

(203) Orygia decumbens, Forsk.—Flowers: Dec.-Feb.—Sind, Punjab, Mysore—Western Asia, Africa.

(204) Mollugo hirta, Thunb.—Not common, in dried up water holes.—Sind, Deccan, S. M. Country, Konkan, all over India—Ceylon warmer regions of the World.

(205) Gisekia pharmaceoides, L.—Rare; flowers: Sept.-Oct.—Sind, Gujarat S. M. Country, Konkan, Punjab, W. Peninsula, Ceylon, Beluchistan, Afghanistan, Africa.

41. *Umbelliferæ.*—

(206) Daucus carota, L.—Cultivated.

(207) Coriandrum sativum, L.—Cultivated.

42 *Rubiaceæ.*—

(208) Spermacoce stricta, L.—Rare; flowers: Nov.-Dec.—Deccan, S. M. Country, Konkan, India—Ceylon, Tropical Asia and Africa.

43. *Compositæ.*—

(209) Vernonia cinerea, Less.—Very common—Aug.-Jan.—Sind, Gujarat, Deccan, Konkans, S. M. Country, Tropical India—Asia, Africa and Australia.

(210) Adenostemma viscosum, Forst.—Common near watercourses, in gardens and fields: flowers: Sept.-Feb.—Deccan, Konkan, S. M. Country, all over India—Ceylon.

(211) Grangea maderaspatana, Poir.—Flowers: Nov.-April.—Sind, Konkan, Kanara, S. M. Country, throughout India—Ceylon, Tropical and Subtropicale, Asia and Africa.

(212) Blumea amplectens, DC.—Flowers: Dec.-Jan.—Gujarat, Konkan, throughout India—Ceylon.

(213) Pluchea tomentosa, DC.—Flowers: Dec.-Feb.—Sind, Deccan, Konkan, Kanara, S. M. Country, Western Peninsula, Central India, Bengal.

(214) Pluchea wallichiana, DC.—Not common; flowers: Jan.-Feb.—Sind, Gujarat, Punjab—Beluchistan.

(215) Pluchea arguta, Boiss.—Not uncommon in stony ground and by the sides of watercourses; flowers: Nov.-Feb.—Sind, Punjab, Beluchistan.

(216) Sphæranthus indicus, L.—Rare, in moist ground; flowers: Nov.-Feb.—Gujarat, Deccan, Konkan, S. M. Country, all over India—Ceylon, Africa, Malay Islands, Australia.

(217) Gnaphalium luteo-album, L.—Sind, Deccan, Konkan, hot and warm temperate countries.

(218) Gnaphalium indicum, L.—Flowers: Dec.-Feb.—Sind, Deccan, S. M. Country—India, Burma, Africa, China, Japan, Australia.

(219) Inula grantioides, Boiss.—Common on rocky ground; flowers: Nov.-Jan.—Sind, Beluchistan, Wazaristan, S. E. Arabia.

(220) Vicoa auriculata, Cass.—Flowers: Nov.-Feb.—Deccan, Konkan, S. M. Country—India, Ceylon.

(221) Pulicaria angustifolia, DC.—Common in sandy soil; flowers: Nov.-Jan.—Sind, Gujarat, Konkan, Western Peninsula, Chota Nagpur, Bengal—Beluchistan.

(222) Siegesbeckia orientalis, L.—Flowers: Nov.-Jan.—Deccan, S. M. Country—Most tropical and subtropical countries of the world.

(223) Eclipta erecta, L.—Flowers: Nov.-Jan.—Sind, Deccan, Konkan, Western Peninsula, Central India, Punjab, Bengal—Burma, Ceylon, Malaya, everywhere in warm climates.

(224) Blainvillea rhomboidea, Cass.—Flowers: Sept.-Oct.—Sind, Deccan—India, Ceylon, Java, America, Australia.

(225) Bidens pilosa, L.—Flowers: Almost all the year—Deccan—Most warm countries.

(226) Echinops echinatus, Roxb.—Flowers: Nov.-Jan.—Sind, Deccan, Konkan, S. M. Country, all over India.

(227) Volutarella divaricata, Benth. & Hook. f.—Flowers: Nov.-Dec.—Sind, Gujarat, Deccan, Konkan, Western, Central, and Southern India—Beluchistan, Afghanistan.

(228) Dicoma tomentosa, Cass.—Flowers: Nov.-March—Sind, Gujarat, Deccan, S. M. Country—W. Peninsula, N.-W. Provinces, Tropical Africa.

(229) Lactuca remotiflora, DC.—Sind, Deccan, S. M. Country—N.-W. Provinces, Arabia.

(230) Launæa pinnatifida, Cass.—Common; Dec.-Jan.—Sind, Gujarat, Konkan—India, Ceylon, Mauritius, Egypt, E. Africa.

44. *Goodeniaceæ.*—

(231) Scævola kœnigii, Vahl.—On the sea-coast; flowers: July-Aug.—Sind, Konkan—Sea-shores of India, Ceylon, Tropical E. Asia, Australia, Polynesia.

45. *Plumbaginaceæ.*—

(232) Statice stocksii, Boiss.—Flowers: Dec.-Feb.—Sind, Gujarat—Beluchistan.

46. *Primulaceæ.*—

(233) Anagallis arvensis, L.—Rare; flowers: Sept.-Jan.—Deccan—Most temperate regions.

47. *Myrsinaceæ.*—

(234) Ægiceras majus, Gaertn.—On the sea-coast—Sind, Konkan, Kanara.

48. *Sapotaceæ.*—

(235) Mimusops elengi, L.—Cultivated; flowers: Dec.-March.—Gujarat, Deccan, Konkan, Kanara—Western Peninsula—Ceylon, Malaya.

(236) Mimusops hexandra, Roxb.—Cultivated in gardens and near wells: flowers: Sept.-Dec.—Gujarat, Deccan, Konkan, S. M. Country—W. Peninsula, Ceylon.

49. *Oleaceæ.*—

(237) Jasminum sambac, Ait.—Cultivated.

50. *Salvadoraceæ.*—

(238) Salvadora persica, L.—Very common; flowers: Nov.-Feb.—Sind, Gujarat, Deccan, Konkan, Kanara, S. M. Country—Drier regions of India, Ceylon, dry parts of W. Asia, Egypt, Abyssinia.

(239) Salvadora oleoides, Decaisne.—Common; flowers: Dec.-March—Sind, Gujarat, Punjab, Rajputana, Aden.

51. *Apocynaceæ.*—

(240) Nerium odorum, Soland.—Grown in gardens, found as an escape in some places; flowers: All the year.—Indigenous in the Western Himalaya and Nepal.

(241) Plumeria acutifolia, Poir.—Cultivated.—Indigenous in Tropical America.

52. *Asclepiadaceæ.*—

(242) Periploca aphylla, Decaisne.—Common on rocky ground, Sind, Panjab—Afghanistan, Beluchistan, Persia, Arabia, Egypt.

(243) Glossonema varians, Benth.—Flowers: Dec.—Sind.—Beluchistan, Persia.

(244) Calotropis procera, R. Br.—Very common; flowers: Dec.-Jan.—Sind, Deccan, Gujarat—Dry parts of India; Ava, Persia, Tropical Africa.

(245) Oxystelma esculentum, R. Br.—Flowers: Dec.—Sind, Deccan, Konkan, Kanara, S. M. Country.—India, Ceylon, Java.

(246) Pentatropis microphylla, W. & A.—Very common, flowers: Sept.-Dec.—Gujarat, Deccan, Konkan—Western Peninsula, Bengal, Pegu, Ceylon.

(247) Dæmia extensa, R. Br.—Very common, flowers: Sept.-Jan.—Sind, Gujarat, Deccan, Konkan, S. M. Country.

(248) Sarcostemma brevistigma, Wight.—Common in stony places.—Deccan, Konkan, S. M. Country—Western Peninsula, Bengal, Burma.

(249) Leptadenia reticulata, W. & A.—Rare.—Gujarat, Deccan, Konkan, S. M. Country, Kanara—Western Peninsula, Punjab, Burma, Ceylon, Singapore, Ava.

(250) Leptadenia spartium, Wight.—Very common; flowers: Dec.-Jan.—Sind, Gujarat—Panjab, Beluchistan, Arabia, Egypt.

53. *Gentianaceæ.*—

(251) Enicostemma littorale, Blume.—Common; flowers: Nov.-Dec.—Sind, Gujarat, S. M. Country, Konkan—Greater part of India, Ceylon, Malaya, Tropical Africa, W. India.

54. *Boraginaceæ.*—

(252) Cordia myxa, L.—Pretty common in gardens and near wells—Sind, Gujarat, Deccan, Konkan—All over India, Ceylon, Egypt, Cochin, China, Tropical Australia.

(253) Cordia rothii, Roem. & Schult.—Very common; flowers: Nov.-Dec.—Sind, Gujarat, Deccan—W. Peninsula, Panjab, Rajputana, Ceylon, Arabia, Abyssinia.

(254) Coldenia procumbens, L.—Flowers: Oct.-Dec.—Sind, Deccan, Konkan, S. M. Country, Kanara—Tropics generally.

(255) Heliotropium zeylanicum, Lam.—Common; flowers: Oct.-Jan.—Sind, Gujarat, S. M. Country, Konkan—Western Peninsula, Panjab, Tropical Africa.

(256) Heliotropium supinum, L.—Common; flowers: Feb.-March.—Sind, Gujarat, Deccan, Konkan, S. M. Country—Western Peninsula, Panjab, Upper Gangetic Plain—Ceylon, S. Europe, N. & S. Africa, Canary Islands.

(257) Heliotropium paniculatum, R. Br.—Rare—Sind, S. M. Country—W. Peninsula, Pegu, Ceylon, Siam, Australia.

(258) Trichodesma indicum, R. Br.—Common; flowers: Sept.-Nov.—Deccan, Konkan, S. M. Country—Greater part of India, Ceylon, Cabul, Beluchistan, Persia, Mauritius.

(259) Trichodesma zeylanicum, R. Br.—Common; flowers: Dec.-Jan.—Gujarat, Deccan, Konkan, S. M. Country, Kanara.

(260) Sericostoma pauciflorum, Stocks.—Flowers: Nov.-Dec.—Sind, Gujarat.

(261) Arnebia hispidissima, DC.—Sind, Gujarat—Western Egypt, Nubia.

55. *Convolvulaceæ.*—

(262) Cuscuta reflexa, Roxb.—Flowers: Dec.-Feb.—Gujarat, S. M. Country, Konkan—Throughout India, Ceylon, Malaya.

(263) Cuscuta chinensis, Lamk.—Common; flowers: Aug.-Oct.—Deccan—Greater part of India, Ceylon, Persia, Australia.

(264) Cressa cretica, L.—Not common; flowers: Nov.-Jan.—Sind, Gujarat, Deccan, Konkan, Kanara—Warm regions generally.

(265) Evolvulus alsinoides, L.—Very common; flowers: Aug.-Jan.—Sind, Gujarat, Deccan, Konkan—Tropical and Subtropical countries.

(266) Breweria latifolia, Benth.—Flowers: Dec.—Sind, Gujarat—Panjab, Tropical Africa.

(267) Convolulus rottlerianus, Choisy.—Not common; flowers: Sept. Oct.—Deccan, Western Peninsula, Afghanistan.

(268) Convolvulus microphyllus, Sieb.—Very common in sandy soil.—Sind, Gujarat—Beluchistan to Egypt and Nubia.

(269) Convolvulus glomeratus, Choisy.—Flowers: Dec.—Sind, Gujarat—Panjab, Afghanistan, Beluchistan, W. Tropical Africa.

(270) Convolvulus arvensis, L.—Common in cultivated ground; flowers: Dec.-Febr.—Sind, Gujarat, Deccan, Kanara—Throughout the world.

(271) Merremia hastata, Hallier f.—Rare; flowers: Aug.-Dec.—Deccan, Konkan, Kanara, S. M. Country—W. Peninsula, Bengal—Ceylon, S. E. Asia, Australia, Tropical Africa.

(272) Ipomœa pentaphylla, Hallier f.—Not common—Gujarat, Konkan—W. Peninsula, Africa, Tropical America, Polynesia.

(273) Ipomœa pilosa, Sweet.—Common; flowers: Sept.-Oct.—Sind, Gujarat—W. Himalaya, Panjab, Bengal, Tropical Africa.

(274) Ipomœa biloba, Forsk.—Common on the sandy sea shore, flowers: all the year round.—Throughout the Tropics on the sea shore.

(275) Ipomœa pes-tigridis, L.—Very common on sandy ground; flowers: Oct.-Dec.—Gujarat, Deccan, Konkan, S. M. Country—Throughout India, Ceylon, Malaya, China, Polynesia, Tropical Africa.

(276) **Ipomœa aquatica, Forsk.**—In ponds, not common; flowers: Nov.-April.—Throughout the Presidency—All over India, Ceylon, Tropical Asia, Africa, Australia.

(277) **Rivea hypocrateriformis, Choisy**—Common; flowers: Sept.-Dec.—Sind, Deccan, Konkan—Western Peninsula, Assam.

(278) **Argyreia speciosa, Sweet.**—In gardens; throughout India, Java.

(*To be continued.*)

REMARKS ON SOME RECENTLY ACQUIRED SNAKES.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

I have lately received from Major G. H. Evans the collection of snakes made by us in Burma some years back, with which are included several interesting specimens collected by Major Evans since.

I propose to make a few remarks on the additions to this collection, and at the same time amplify the remarks made by us on certain specimens which were published in a former Journal (Vol. XIII, pp. 343 and 611.

Dinodon septentrionalis.

I received a remarkably fine specimen of this rare, and very handsome species obtained from the Ruby Mines District, where, Major Evans tells me, he has had another example now lost.* It measures 3 feet 4⅛ inches in length, the tail accounting for 7¾ inches. It bears a very marked resemblance in colouration to the Burmo-Chinese Krait (*Bungarus multicinctus*), so much so that I put the specimen with these kraits into one bottle, and only discovered my mistake when examining the lepidosis critically.

Description.—*Rostral.*—Touches 6 shields; the sutures made with the anterior nasals, and internasals subequal, and about twice those made with 1st labials. *Internasals.*—Two: the suture between them less than half that between the præfrontal fellows, and about half the internaso-præfrontal sutures. *Præfrontals.*—Two: the suture between them one-third to one-fourth greater than the præfronto-frontal suture; touching the internasal, postnasal, loreal, præocular, supraocular, and frontal. *Frontal.*—Touches six shields: the sutures subequal. *Supraoculars.*—Length equals the length of the frontal, breadth less than half breadth of frontal along a line connecting centres of eyes. *Nasals.*—Divided, in contact with the 1st and 2nd supralabials. *Loreal.*—One, not touching the internasal nor the eye. *Præocular.*—One, barely reaching the crown. *Postoculars.*—Two. *Temporals.*—Two touching the 4th, 5th and 6th supralabials on the right side, the 5th, 6th and 7th on the left. *Supralabials.*—Eight, the 3rd, 4th and 5th touching the eye on the left side, 7, the 3rd and

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* Mr Boulenger has recorded a specimen from the same locality (Mogok) in this Journal (Vol. XVI, p. 235).

4th touching the eye on the right. *Posterior Sub-linguals* subequal to anterior, in contact with the 4th and 5th infralabials on the right side, the 5th and 6th on the right. *Infralabials.*—The 5th is the largest on the right side, and touches two scales behind, on the left side these shields are damaged. *Costals.*—Two-heads lengths behind the head 17, midbody 17, two heads-lengths before the vent 15. The reduction from 17 to 15 is brought about by the confluence of the 2nd and 3rd rows above the ventrals on the right side, the 3rd and 4th on the left. The last row is barely or not enlarged. Keels appear to be very obscurely present in the median rows in the posterior part of the body. Apical pits present, single. *Ventrals.*—217, obtusely angulate laterally. *Anal.*—Entire. *Subcaudals.*—82, 2nd, 3rd and 4th entire, rest divided.

Colour.—Glossy black with 27 pure white, narrow, well defined arches over the body and 13 over the tail. These involve a scale or a scale and a half vertebrally and dilate in the flanks. The belly is pearly white, but on the tail the dorsal black forms complete bands. The eye has the pupil vertical.

I have not been able yet to satisfy myself that the dentition agrees with that used by Mr. Boulenger to characterise this genus, but two points in external characters are, I think, sufficiently important to justify my doubts on the generic title. In life* the iris is invisible so that the whole eye is black. This appears to be a feature peculiar to the *Lycodon* group and is not seen in other *Dinodons*, at least not in the Japanese *japonicus* nor the Chinese *rufozonatus*, both of which I have seen in life. Further the apical pits are single as I find them in 9 species of the Genus *Lycodon*, not in pairs as in the *Dinodons* I have examined.

Lycodon fasciatus.

In addition to several specimens of this snake from Major Evans I have lately received eight examples from Mr. Hampton from the Ruby Mines.

The specimen alluded to by Major Evans and me in a previous Journal (Vol. XIII, p. 372) as having no præocular I find on re-examination shows us in error. There is a very small præocular on each side beneath which, and the loreal, the præfrontal finds contact with the eye. I have never seen the same abnormality in any other specimen. One has the 3rd and 4th subcaudals entire. The ventrals and subcaudals of Mr. Hampton's specimens are as follows :—

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* I recently acquired a live specimen from Jeypore, Assam, near the foot of the Naga Hills.

202+84
208+82
212+88
209+83
207 +83
205 ?+82 ?
210 ?+79

(The range of these shields in 14 specimens collected in Shillong last year by me was ventrals 201 to 213, subcaudals 74 to 80.)

The largest Burmese specimen is 3 feet, and two small ones apparently hatchlings, measure 8¾ and 8⅛ inches.

Colour.—The black bands on the body vary from 28 to 33 and on the tail from 15 to 17. My Shillong specimens had the light bands of a dove colour, whereas nearly all the Burmese specimens are yellow, or yellowish. Evans noted one specimen from Maymyo with reddish-yellow bands (Vol. XVI, p. 169 of this Journal) and Anderson, (Ann. Zool. Yunnan, p. 827) one with 55 reddish bands. In some specimens the light bands are divided by a black line of varying breadth. In one such from Mogok the intermediate black is so broad that each light band is represented by a pair of light lines, and it is probable that Anderson's specimen from Yunnan was similar, thus accounting for the bands being reported as 55, *viz.*, about twice as numerous as normal. I cannot satisfy myself that the dentition conforms to that characterising the genus *Lycodon* as enunciated by Mr. Boulenger, and the fact that the iris in life is flecked with grey, and the apical pits where evident are in pairs seems to point to the better inclusion of this species with the genus *Dinodon.*

Callophis maclellandii.

One specimen calls for special remark from its size, measuring as it does 2 feet 7½ inches. The colour is violaceous resembling the hue of the bloom on a plum or grape. It has 29 bands on the body and 3 on the tail, and represents variety A of Mr. Boulenger's Catalogue. The lepidosis is typical in every way.

Simotes cyclurus.

At least 4 specimens recently obtained from Burma demand some remarks. One marked with indistinct longitudinal dorsal bands, and with the belly unspotted corresponds to Boulenger's variety C. The lepidosis agrees with *cyclurus* in every way but the following. The supralabials are 7 with the 3rd and 4th touching the eye on the left side, the anal is divided, and the costals two heads-lengths behind the head number 17. I prefer to regard these differences as abnormalities, at any rate for the present, and place the specimen with *cyclurus*. The ventrals are 169, and subcaudals 46.

Another constitutes a colour variety not given by Boulenger in his Catalogue (Vol. II., p. 220). There are 9 dorsal bars across the body, and 4 on the tail. These are margined blackish and are markedly indented anteriorly, and posteriorly vertebrally, and so much so costally that fragments are often detached. The marks are therefore very like those seen in *S. splendidus*, and one variety of *albocinctus*. The intervals are variegated with short blackish, and buff oblique streaks. The belly is heavily chequered with black. Scale characters agree with *cyclurus* except that the 3rd labial is not divided, hence the little shield to which Mr. Boulenger applies the name "subocular" is absent. The ventrals are 171, and subcaudals 36.

A third specimen agrees with Boulenger's variety A, except that no longitudinal dorsal bands are visible. The costals are in 19 rows two heads-lengths behind the head, and 21 in midbody. Normally the costals in these two situations number the same in this as in other species of *Simotes*. The ventrals are 174, and the subcaudals 50. A fourth specimen agrees with Boulenger's variety A, except that the longitudinal dorsal bands are obsolete.

Simotes splendidus.

There are three specimens not including the head and neck of our original specimen reported in this Journal (Vol. XIII, p. 537). Two specimens are those recorded by Major Evans in this Journal (Vol. XVI, p. 362). I count the ventrals in the former specimen (11½ inches long) 185 not 174 as reported by Major Evans. A third specimen measures 9¼ inches. In this the 3rd and 4th supralabials are divided transversely on both sides. The temporals are irregular in these specimens; in No. 1 (11½ inches) the upper is confluent with the parietal, a slight partial suture indicating that this is the true interpretation of the anomaly. In No. 2 (28¾ inches) the temporals are two. In No. 3 (9¼ inches) the lower temporal is divided.

No. 1 specimen has 15+3 bars on body and tail, and the ventrals and subcaudals 185+35. No. 2 has 15+3 bars, and ventrals and subcaudals 174+43. No. 3 has 15+3 bars and ventrals and subcaudals 193?+37. All these specimens agree in the following ways. The rostral is higher than broad; and the portion visible above is greater than its distance to the frontal. The internasals are four, the median pair separating about ⅔ of the præfrontals. The præfrontals are two. It will be remembered that in our original partial specimen there were four. The frontal is longer than the parietals. The anterior nasal is much larger than the posterior, and the suture from the nostril runs to the 2nd supralabial, a very unusual character in any snake including the members of this genus. The loreal is about as long as high or shorter.

I think I can show good reason to doubt the accuracy of the locality from which the type specimen is supposed to have been collected, *viz.*, Wynad (*vide* Boulenger's Catalogue Vol. II, p. 218).

My study of the geographical distribution of snakes in India has brought to light the fact that no less than eight species have been recorded from Southern India on the sole authority of Colonel Beddome which are otherwise only known from Tracts to the North and East of Peninsular India.

These are: 1 *Tropidonotus parallelus*, 2 *T. subminiatus*, 3. *T. himalayanus*, 4 *Lycodon jara*, 5 *Simotes splendidus*, 6 *Bungarus fasciatus*, 7 *Simotes octolineatus*, and 8 *Dendrelaphis caudolineatus* (*vide* Boulenger's Catalogue and Sclater's list of Snakes in the Indian Museum, 1891). Now the first 6 of these are all to be obtained in Burma, and the last 2 in Tenasserim. That Beddome received snakes from Burma is certain as he presented specimens of *Simotes cruentatus* and *Dipsadomorphus hexagonotus* from Burma to the British Museum (*vide* Boulenger's Catalogue). Again he obtained specimens from Tenasserim as he presented the British Museum with specimens of *Simotes violaceus*, and *Simotes cyclurus* from that region (*vide* Boulenger's Catalogue). This being so one cannot escape the conviction that a collection of snakes from Burma including specimens of the first 6 specified above, and another from Tenasserim including numbers 7 and 8 were inadvertently mixed up with his Southern Indian Collection. The mistake is one very easy for any collector to understand.

Simotes theobaldi.

Several specimens were received, some of which have been previously recorded in this Journal. The colour varieties A and B mentioned by Boulenger in his Catalogue are doubtful. I find every gradation between the two. In some there are a very few spots on the belly congregated before the anus and none elsewhere. In others there are a very few spots scattered along most of the belly length, and in others no single spot. The features which specially attracted my attention are as follows:—*Rostral.*—The height nearly equals the breadth; the visible portion above is distinctly less than its distance to the frontal. The frontal is distinctly shorter than the parietals. The anterior nasal is considerably larger than the posterior, but the lower margins of the two are subequal. The suture from the nostril runs to the 1st labial. The loreal is distinctly longer than high, sometimes as much as twice the length. The ventrals and subcaudals of 9 specimens are as follows:—177+32, 170+?, 170+35, 169+31, 169+40, 164+30, 168+39, 180+33, and 167+40.

Dryophis mycterizans.

One of the fœtus removed from a gravid female, recorded by Evans and myself in this Journal (Vol. XIII, p. 615), I have re-examined and find measures about 13 inches. We omitted to note this. I received with other snakes from Major Evans three specimens of the peculiar colour variety of this snake with grey on the belly between the white lines. I think it should be given a distinct title, and propose for it *tephrogaster.* I cannot be sure whether these came from Burma or were part of a collection obtained for me in Ceylon (Henaratgoda). They agree in scale characters with *mycterizans.* The ventrals and subcaudals are 176+146?, 176+153, and 181+151.

Amblycephalus andersoni.

I examined three specimen's of this hitherto little known snake. The exact localities in Burma are not recorded. The longest is 1 foot 7 inches. The vertebrals are not enlarged. The ventrals and subcaudals are 150+45, 163+45, and 156+40. It is sometimes doubtful in this as in other *amblycephalus* whether the subocular is a single elongate crescentic shield, or whether divided, as it is very prone to be thrown into one or more creases resembling sutures. I think in these examples the shield is without doubt entire, except on the right side in one specimen where it appears divided by a suture.

Lachesis purpureomaculatus.

Three specimens were included in Major Evans' collection with the scales 25 in midbody, and which, according to Mr. Boulenger's Catalogue, should be considered as belonging to this species. I have the greatest doubt of the validity of this species, for I can see no differences other than the number of the costal rows between specimens called by him *gramineus* and *purpureomaculatus*. I have examined three and four times over all the available specimens of both in the British Museum collection and again in other Institutions and have taken particularly careful notes of the commoner varieties with 21 rows in midbody. Again now I have contrasted the three specimens with 25 costal rows, with five others from Burma where the costal rows are 23, and five others with 21 rows. I can find no means of separating these except by the costal rows, and consider that all these specimens belong to one species which is remarkable for the variability of the costal rows, *viz.*, 19 to 27. Specimens in which the costal rows number 25 to 27 should, I think, be considered as variety *purpureomaculatus* of the species *gramineus*, which title claims priority.

Haplocercus ceylonensis.

I have examined two specimens of this rather uncommon Ceylon snake. I notice that the anterior nasal shield is confluent with the 1st supralabial, and the same feature occurred in the only specimen I saw in the Colombo Museum last year. The 4th supralabial alone touches the eye in both specimens. The ventrals and subcaudals are 190 + 42, and 217 + 44. These were both obtained, I am almost certain, at Henaratgoda (Ceylon).

THE SPORT OF KINGS.

BY

C. H. DONALD.

A cold crisp morning in February, a team of falcons in perfec "Tarak" and a good trusty horse beneath you, and what could man want more to make his enjoyment complete and a holiday something to be remembered in after years. All very fine you say, but the falcons are not much use without the quarry, and that is not always a certain find! Well, that may be so, but to obviate that risk, train your falcons to something that you are sure to find. I had the misfortune to be stationed in an out-of-the-way place in the Punjab, where a whole day's outing with the gun might, if you were lucky, furnish you with a couple of brace of snipe, a few duck and possibly a hare, so I dispensed with my gun and promptly sent for my old falconer and his brother, who was also his assistant, and set to work to catch and lay in a stock of falcons on the "something for everything" principle. A few days' roaming about the river bank with a net, a set of nooses and some mynahs and sparrows in a cage, and I had collected two peregrines—one a haggard and the other a splendid dark bird in her first year—a saker, a luggar and two merlins, and within the month was ready for houbara, herons, paddy-birds, crows, kites, hoopoes and larks, and surely it would be a bad day on which I could not find one or other of the above. The saker I kept exclusively for kites, the young peregrine was all there when she saw a heron, and both had also been "entered" to houbara. The luggars showed me many a good chase, when all else failed, after a luckless crow or a squaking paddy bird; and the little merlins, last but by no means least, were the prettiest sight of all to watch ringing up after a lark or a hoopoe, or putting in stoop after stoop as they got above their quarry.

With such a team out, I need never despair of a chase somewhere. If I could get away for the whole day, both peregrines and a luggar or the merlins accompanied me, and we sallied forth to the sand hills, some 5 miles out from my bungalow, and a fairly certain find for houbara, where scattered fields of mustard, now in flower, attracted them and clumps of "dhak" bushes afforded ample cover during the day.

After my peregrines had gone through their training and accounted for the houbara, which my falconer had trapped and loosed in front of them, as also for the heron, we decided to give them a fair trial and see how they would acquit themselves when it came to the real thing. I sent off both falconers, with the peregrines and one luggar, in the afternoon to wait for me at a village, near the houbara ground, and I started off myself at 4 a.m. the following morning. On arrival my men gave me the good news that they had seen the tracks of houbara all about the mustard fields and that there must be at least four of them about. As soon as it was broad daylight, we sallied forth, accompanied by a crowd of village urchins to beat for us, and by the time the sun was well above the horizon we had reached our hunting grounds and formed a long line with the falconers at each end, I in the middle with the young peregrine which was to be slipped first, and the boys filling up gaps in between, extended to about 30 paces interval. For the first half hour or so we had no luck, though we came across plenty of tracks, so knew the birds were not far off, but suddenly fortune smiled on us and up got two houbara some 50 yards ahead of us. I immediately unhooded my bird and slipped her. One of the houbara dropped as soon as he saw the falcon and ran into a bush, but the other one went off all he knew. The falcon looked as though she was going to stick to the flying bird, as she kept on its track, rising as she went, when all of a sudden she closed her wings and dropped like a rocket straight into the bush where the first houbara went. Shouting to the falconer on my right to keep an eye on the still-flying houbara, I galloped up to the bush and there, to my delight, found the falcon with the struggling houbara firm in her talons. The old falconer danced round like a two-year old, with delight, saying, now the bird was "made" and had become a tiger (*sher ho gya*), which, being interpreted, meant that she had been blooded and there was no fear of her ever refusing an houbara when she saw one.

We gave her a mouthful of flesh and some warm blood from the throat, then hooded her and started afresh after the one which my second falconer had marked down about half a mile further on, but before we got there we put up four others. This time the haggard was slipped, and away she went with quick sharp flaps, rising steadily but not going very fast, and all four houbara stretched out their long necks and went off full speed ahead, and I knew I was in for a gallop. After the last kill, I had handed the peregrine I had to the second falconer, so with the "lure" in my pocket, in case of accidents, set spurs to my horse and off we went. There was only one houbara in view now, the others having gone off at a tangent, and this one was gaining steadily on the falcon and also rising, a thing they do not often do, but the falcon, though far behind, was considerably higher than the houbara and I was getting badly left, though my horse was going about 14 annas, when, for some unknown reason, the houbara turned slightly to the right and gave me the chance of a short cut. Just then, too, the falcon saw her opening and came down with half-closed wings and was up to the houbara in a couple of seconds, but missed her stoop and rose straight up again like a rocketing partridge, only ten times as fast. The houbara doubled and came straight back, over my head, and the falcon, finding her pitch, turned and came down like a shooting star, her white breast gleaming in the sunlight. Since her last stoop, the houbara had got about 200 yards' start, but she is up to him in no time and once more the houbara jinks and is away for all he is worth, while the falcon rises with the impetus she has on, and, recovering, turns and is once more descending with semi-closed wings, with every now and again a flap to accelerate her already terrific pace. By this time we have got back to almost the exact spot whence the houbara started, and as I ride through the line of my beaters, now no longer a straight line, with my eyes fixed on the birds above, I hear various shouts and yells of encouragement from the deep bass of the old falconer to the excited, almost crescendo shrieks of some of the boys:—"*Eh-lya, lya-eh-hai, butchgya,*" beginning in more or less natural voices, as the peregrine begins her stoop, till the "*hai*" is almost a shriek and the "*butchgya*" ends off with almost a sigh, as the falcon once more misses and rises to find her pitch. My old falconer, no less excited than the boys, old as he is, comes rushing along madly, holding a fluttering falcon which cannot find a perch on his shaking fist, on one hand, while the other is grabbing frantically at the end of his turban, which drags along some yards behind him, now hurling anathemas at his turban, now reviling the female ancestors of the falcon on his fist to the 3rd and 4th generation, for "baiting" when it should sit still and suddenly as the haggard above returns to the charge, shouting endearing epithets by way of encouragement :—" *Shaibush, mera beta.*" They were all his "sons" when showing good sport, in spite of the fact that I had not a tiercel among them and they were all females, but his own sons are much more precious to him than his daughters, so my falcons naturally took first place and were called sons indiscriminately.

At last the old houbara found it getting too hot for him up above, the stoops getting more frequent and the distance too near between him and his enemy, suddenly dropped to the ground, spread out his tail, dropped his wings, the tips touching the ground and prepared to show fight. In an instant the falcon was down, but the head of the houbara, which had been held high, suddenly ducked and the falcon swooped past, returned at once, missed again and sat on the ground alongside ; in an instant the houbara saw his chance and was off and before the falcon realized what had happened, was two hundred yards or more distant. Up got the game little falcon, hard upon his tail, and then I saw, to my surprise, a second one follow. The old falconer, seeing the haggard a bit done, slipped my other one, to ensure a kill and "blood" the old haggard, which had certainly earned it. The falcons had frequently been flown together at the "lure," so did not go for each other's jesses as they would otherwise have done, but both made for the fast vanishing houbara.

The young bird, being fresh, soon took the lead and meant to waste no time or energy about rising too high, so kept low and went full speed ahead, closely followed by the haggard, who, however, kept rising. The houbara, with neck well stretched, with long full flaps of his ample wings, was going all he knew, and I had grave doubts as to whether I should even see the end of the chase. On we went over that plain, passing here some cultivation, there a village with all the inmates thinking the sahib had gone "dotty," not seeing the object of my wild career, and the falcons steadily gaining. The houbara, seeing this, tries once more his old tactics which had been so successful before, and goes to ground. Down comes the young hawk who leads, gets a claw full of feathers and sits on the ground, and the houbara is off again, but this time there is a second falcon who is at that very moment stooping at about 100 miles an hour, and before the houbara has got in two flaps of his wings, she is on him and sends him staggering to the ground again, turns at once and binds and the first one is not much behind and there they sit each with a firm hold of the luckless houbara and each dying to begin her feed, but afraid of the other ; but fortunately they do not begin to fight. I have watched the whole tragedy from some distance behind as well as the water pouring from my eyes from racing through the cold air would admit, and now dismount, or rather tumble off my horse, who is too done to stir, and cutting up the houbara, give the falcons a well-earned feed, but having no hoods with me, I have my work cut out taking them back. Fortunately the old horse was quiet and accustomed to being left to himself, so followed meekly behind.

The whole hunt had taken about 1½ hours and I was back for breakfast about 11 a.m. with two houbara, or rather what remained of the second. A glorious morning's sport and two falcons fairly broken to houbara. That same afternoon, having nothing to do, I took out the two merlins on to a great plain which stretched for about two miles or more beyond my bungalow and soon put up a hoopoe, which " lolloped " along getting further away from the tree and got on to a babul tree, of which there were a few dotted about the plain.

I flushed him thence and he went off unconcernedly to another and far enough from the big clump of trees near my bungalow to give a chase. I again flew him up and he very accommodatingly still went ahead, and after he had got about a hundred yards, I slipped one of the merlins. The hoopoe, on seeing it, was no longer the slow good-for-nothing of a minute ago. Up he went, as only a hoopoe, a lark or a roller can rise, almost straight up for the first couple of hundred feet and then in long spirals and seemingly ever so much faster than the little falcon, which at first got left behind, but then gained steadily, till both birds looked more like butterflies than birds. Now the falcon has at last got above and the hoopoe drops like a stone for the tree it has just left. Down too comes the falcon, and just as you think she has got the hoopoe, the stone once more becomes a butterfly, the wings suddenly open, the tail spreads out and the hoopoe, a past master in the art of dodging, has jinked aside and the falcon dashed past. The impetus carries her back to the height whence she first stooped and she is round and down again, while the hoopoe is again transformed into a falling stone. Thus the play goes on, but the merlin is giving up her tremendous dashes, which carry her yards past her quarry each time and contents herself by coming slower and turning quicker. Now the hoopoe is fluttering up again ; the falcon makes a dash from below and you think" that's got him," but no, there goes the falcon past and the hoopoe is again dropping. Again they are together, a twitch of the wings and the merlin and the hoopoe are yards apart. At last the hoopoe is into the tree, but it's a scraggy sort of tree and and affords poor protection. As the falcon dashes in after it, the hoopoe dodges, gets on to another branch, puts up his crest, bobs his head and gives vent to a curious noise, between a cough and a hiss. At last the falcon hustles him out of the tree and chases him round it, while you throw anything you can lay your hands on to keep him out, but somehow, another sudden twitch, a double and the hoopoe sits on the topmost twig and the falcon is twenty yards beyond. Frantic at being thus outdone, she puts on all the speed at her command, and that has to be seen to be appreciated. I believe the flight of the peregrine and the shaheen falcons has been estimated at between 100 and 150 miles an hour when stooping and that of the merlin nearly 200, but how far this is correct, I am unable to say. Anyway it cannot be far off the mark.

This time she surely has the hoopoe, who sits serenely aloft, but again the merlin is 30 yards the other side and the hoopoe well in the middle of the tree, making himself as small as he can.

Another bout of hide-and-seek and general post from branch to branch and the hoopoe is again bustled out of the tree and this time foolishly quits it altogether and makes for the next one, followed by the falcon, who simply will not leave it now, and there they go, zig-zag, up and down, as though they were tied to each other and the falcon appears to almost touch him every time, but the hoopoe still goes on somehow, and manages by a miracle to avoid those talons. They are now within a foot of the ground, now up twenty feet, now down again, and there she has him, as a lot of feathers fly ;

but no the hoopoe is up again, but he has been hurt and this is his last move and the next instant the chase is over and the game little falcon sits on her quarry, covering it with drooping wings, her mouth wide open and panting as if her little heart was bursting. We had stood practically in the same place whence the chase began, from start to finish and yet witnessed as pretty a sight as one could well wish to see.

Now, my little beauty, you have a well deserved feed and a good rest. A pretty, affectionate and a delightful little pet, no bigger than a cuckoo, and for pluck, for its size, second to none and at the same time the prettiest and fastest flier of the whole family of the "Falconidæ" and easily tamed and trained. So ended a delightful day with the falcons. Of course the falcon does not always catch her quarry, indeed it is oftener the other way, but what does that matter, so long as you have a good run and plenty of "stoops" and excitement. Long live the Sport of Kings and may it once more become as popular as in days of yore.

A NEW PIT VIPER OF THE GENUS *ANCISTRODON*.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

ANCISTRODON MILLARDI.

Under the title *Ancistrodon hypnale* Professor Boulenger* appears to me to have mixed up two very definite forms each of which I consider is entitled to rank as a distinct species.

I am very familiar with a form which is common in the Hills of Ceylon, having examined no less than 41 specimens from Hakgalla (5,600 feet).

This form is characterised by a very pronounced appendage on the snout which is covered with minute scales (8-12). It has the supraoculars relatively small, these being about three-fourths to four-fifths the length of the parietals, and as broad as the frontal along a line connecting the centres of the eyes. Again the ventrals are fewer (116 to 131) and so are the subcaudals (24 to 37) than in the other form.

Now I have lately received through Mr. Millard a specimen from Castle Rock which attracted my attention in possessing a slight boss, not an appendage on the snout, covered with scales similar in size to those elsewhere on the snout (4 to 6). Further the supraoculars are unusually developed being as long as or longer than the parietals, and broader by one-third than the frontal, along a line connecting the centres of the eyes. The ventrals and subcaudals are in excess of the common Ceylon Hill form *viz.*, 151 + 36 (tail imperfect). Since this Mr. Millard has submitted to me 4 more examples from Carwar agreeing in every way with the Castle Rock specimen. A study of the British Museum specimens as given in Professor Boulenger's Catalogue (I have not examined them) supports the view that under *hypnale* he is dealing with two distinct forms for there appear to be two distinct ranges of ventrals and subcaudals, and in his description he says "snout more or less turned up." I append his figures, and mine in tabular form for easy reference.

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* Catalogue Vol. III, p. 528.

Number of specimens referred to.	Ventrals.	Subcaudals.	Authority.	Habitat.
41	116 to 131 ...	24 to 37 ...	Wall ...	Ceylon (Hakgalla).
2	125 to 128 ...	28 ...	Boulenger...	Ceylon.
Total ... 43				
6	141 to 152 ...	30 to 43 ...	Boulenger...	Ceylon.
7	136 to 141 ...	35 to 44 ...	Boulenger...	India (Belgaum and Anamallays).
5	141 to 151 ...	36 to 44 ...	Wall ...	India (Castle Rock and Carwar near Western Ghats).
Total ... 18				

From this it will be seen that 43 examples from Ceylon have a range of ventrals from 116 to 131, and subcaudals 24 to 37. In 18 others from Ceylon and India (Western Ghats) the range of ventrals is 136 to 152, and subcaudals 30 to 44.

The former species which I take to be "forma typica" has the pronounced nasal appendage, and fewer ventrals, and subcaudals. The latter form appears to me equally deserving of a specific title, and I propose to call it *millardi* in recognition of the great impetus given to Natural History researches in India by Mr. W. S. Millard by years of indefatigable labour in the interests of our Society.

Description.—Snout with slightly developed prominence above, covered with from 4 to 6 scales subequal to those seen elsewhere on the snout. *Frontal.* Less than distance to end of snout, about two-thirds the breadth of the supraoculars on a line connecting the centres of the eyes. *Supraoculars.* As long as the parietals. *Nasal.* An entire shield in contact with the 1st but not the 2nd labial. *Loreal.* A single shield behind the nasal grooved to form the inner wall of the loreal pit, and quite distinct from the 2nd supralabial.* *Præoculars.* 3, the lower two diverging to border the loreal pit. *Postocular.* One. *Subocular.* Usually one long arc-shaped shield, sometimes subdivided. *Temporals.* One enlarged row. *Supralabials* 7, none touching the eye. *Infralabials* 8. *Sublinguals.* A single pair.

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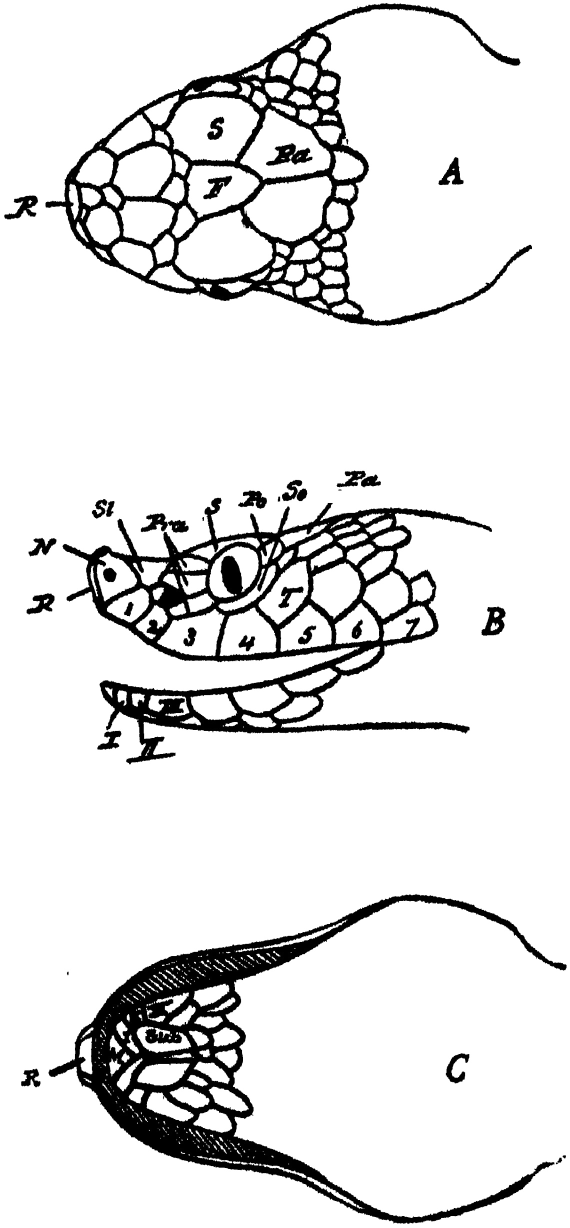
* In this it agrees with *hypnale* though Boulenger (Cat. Vol. III, p. 528) says that the 2nd supralabial enters the loreal pit in that species.



Ancistrodon millardi (×3).

NOTES ON A COLLECTION OF SNAKES FROM PERSIA.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

Our Society is indebted to Lieutenant A. T. Wilson (32nd Sikh Pioneers) for a most valuable and interesting donation of snakes collected by him in Persia.

The collection includes 50 specimens, comprising 15 distinct species, no less than 3 of which are new to science. In three other instances the habitat previously recorded has been considerably extended, viz., *Contia decemlineata*, *C. coronella*, and *Zamenis gemonensis*. Mr. Millard has very kindly given me the privilege of classifying this collection, and making the following remarks upon the specimens included.

Lieut. Wilson says :

" The snakes sent to the Bombay Nat. Hist. Society for identification were collected at a place known as Maidan Mihaftan 30 m. E. of Shushtar in S. W. Persia (see sheet 72. S. W. Asia . 8 m. = 1"). It is a typical spot in the narrow belt of low hills which intervene between the Zagros mountains and the vast flat plains of Persian Mesopotamia. The zoological types in this belt are distinct from those of Persian Mesopotamia, and closely allied to those of the Zagros mountains. Practically treeless, with a total rainfall of 7", all of which falls between November and March and destitute of water except in a few favoured spots, it is deserted by man in summer, the nomad tribes moving to their summer quarters in the Zagros at the end of March. Large birds are rare, as also is the mongoose : field mice and locusts are extremely common—a state of affairs favourable to reptiles. From May to July snakes abound everywhere, but are seldom seen after July.

The district is extremely hot in summer, the average maximum shade temperature for June, July and August being over 117°. "

Family—TYPHLOPIDÆ.

Typhlops wilsoni, spec. nov.

A single specimen.

Description.—*Costals.*—2 heads lengths from head 24, midbody 24, 2 heads lengths before anus 22. *Rostral.*—About one-third the breadth of the head, not reaching as far back as the eyes, in contact with the internasal. *Nasals.*—Just fail to meet behind rostral. The nostril is lateral; an upper suture passes towards but fails to meet the rostral, the lower suture passes to the 2nd labial. *Præocular.*—Touches the 2nd and 3rd labials, and the subocular. *Ocular.*—Separated from labials by a subocular. The eyes are distinct, and their diameter about half the ocular shield. *Supraoculars.*—Just fail to meet. The *internasal*, *frontal*, and *supraocular* shields subequal, and smaller than the *occipitals*, and *parietals* which are subequal. *Labials.*—Four. Snout rounded. Length 1 foot 1½ inches, *i.e.*, 38 times the diameter at midbody. Tail with a single small spine directed downwards, and slightly backwards. *Colour.*—Uniform dirty brown.

I attach Lieutenant Wilson's name to this interesting addition to our Asian ophifauna.

Family—GLAUCONIIDÆ.

Glauconia macrorhynchus.

A single specimen of this little known snake.

Reference to Mr. Boulenger's Catalogue (Vol. I, p. 62) shows that the habitat "Euphrates" was dubious. This specimen now clears up any doubt as to this locality. It agrees with Mr. Boulenger's description excepting in the width relative to the length. I find this taken laterally is contained 81½ times in the total length (Blgr. 113 times). In case there should be any confusion in identification I attach another description.

Rostral.—Very much broader than one-third the width of the head; reaching back to a line connecting the anterior edges of the eyes; in contact with the frontal behind. *Nasals.*—Reaching to the labial margin. Nostrils lateral; an upper suture passes from them to the rostral; a lower to the 1st labial. *Ocular* descends to the lip between the 1st and 2nd labials. Eye very black, about half the ocular shields in diameter. *Frontal* and *Supraoculars.*—Subequal. *Postoculars.*—Twice as broad as the height of the 2nd labial.

Labials.—Two ; the first between the nasal and the ocular, the second behind the ocular. *Costals* in 14 rows.

Snout hooked, its inferior præoral surface concave. Length 9½ inches, *i.e.*, 81½ times the length of the lateral diameter in midbody. Body very distinctly compressed. *Colour*—Pinkish anteriorly, merging to a pale uniform greyish.

Family—BOIDÆ.

Eryx jaculus.

Six specimens.

Agree with Boulenger's description, but there are one or two additional points I consider of importance I would like to call attention to. As in others of the Family I know the ventrals begin in the throat at an unusual distance behind the mental groove. The last two ventrals are narrower than the preceding. The last costal row is much enlarged and just one-half the breadth of the ventrals in mid-body, a feature that I expect will prove constant in all the species of the Family, and also found in the single species of the Family *Xenopeltidæ*. The nasals touch the 1st and 2nd supralabials, a suture running from the nostril to the 2nd. *Supralabials.*—The first three, four, or five are high, the rest divided, their lower parts decreasing in size from before backwards. *Infralabials.*—The first four or five are entire and broad, the rest divided.

No. of specimen.	COSTALS.			Ventrals.	Anal.	SUBCAUDALS.
	2 heads lengths behind head.	Midbody.	2 heads lengths before vent.			
1	47	52	35	198	1	27. The 18th to 22 divided, rest entire.
2	44	50	35	195	1	30. All entire.
3	47	52	39	197	1	26. All entire.
4	45	51	37	190	1	28. 13th, 14th and 15th divided, rest entire.
5	48	54	39	199	1	25. 4th and last 2 divided rest entire.
6	48	52	37	191	1	26. 6th and 7th divided, rest entire.

Family—COLUBRIDÆ.

Series A.—AGLYPHA.

Sub-family—COLUBRINÆ.

Tropidonotus tessellatus.

Two specimens.

No. of specimen.	COSTALS.			Ventrals.	Anal.	Subcaudals	Loreals.	Præoculars.	Postoculars.	Temporals.	Labials.	Lab. touching eye.
	2 heads lengths behind head.	Midbody.	2 heads lengths before vent.									
1	19	19	17	176	2	69	1	3	4	1	8	4th
2	19	19	17	170	2	?	1	3	4	1 {	7 right 8 left	3rd right 4 left

The lowest præocular is minute. As in other *Tropidonoti* the reduction of the costal rows from 19 to 17 is effected by a coalescence of the 3rd and 4th rows above the ventrals. Keels are absent in the ultimate row, only in about the anterior two-thirds or so of the body. Apical pits are very obscurely visible in pairs, at any rate anteriorly. The nasal is semidivided, a suture running from the nostril to the 1st labial.

Zamenis rhodorhachis.

Four specimens. One is a very beautiful example of variety *typica*, with a very bright pink vertebral stripe. The others conform to variety *ladacensis*.

No. of specimen.	COSTALS.			Ventrals.	Anal.	Subcaudals.	REMARKS.
	2 heads lengths behind head.	Midbody.	2 heads lengths before vent.				
1	19	19	13	238	2	?	Var. *typica.*
2	19	19	18	226	2	187	„ *ladacensis.*
3	19	19	13	232	2	?	do.
4	19	19	13	241	2	185	do.

The absorption of the costal rows is interesting. The two first steps from 19 to 17, and from 17 to 15 occur close together so that they may be reversed but usually the two rows next to the vertebral, *i.e.*, the 8th and 9th blend first and then the 3rd and 4th or 4th and 5th rows above the ventrals. From 15 to 13 the two rows next the vertebral again blend, *i.e.*, the 6th and 7th above the ventrals.

I noticed in specimen No. 2 a faint indication anteriorly of a pinkish vertebral stripe so that it seems probable intermediate forms will be met with to connect the two colour varieties. The 4th supralabial is divided in both forms, and I think it would be more correct to say that the 4th, 5th and 6th usually touch the eye, not the 5th and 6th only. (*vide* Boulenger's Catalogue Vol. I., p. 398). The upper part of the 4th is referred to by Mr. Boulenger as a subocular, an opinion I am opposed to. The origin of this small shield appears to me obvious in this and some other species of *Zamenis* and in some *Simotes* and analogy dictates its origin from the 4th supralabial.

Zamenis microlepis.

Two specimens.

COSTALS.			Ventrals.	Anal.	Subcaudals.	Supralabials.	REMARKS.
2 heads lengths behind head.	Midbody.	2 heads lengths before vent.					
38 ?	45	29	253	1	109	16 Right. 17 Left.	
35	41	28	244?	1	97	16	

The ultimate costal row is relatively very large, being nearly three times as broad as the median rows and the length of each scale is about twice that of the scales in the penultimate row. It is also very peculiar in that each scale touches three above instead of two which is the almost invariable rule in snakes. The parietals are peculiar in that they touch no postocular. The supralabials are peculiar in that the first two and the last two or three are entire, and all the rest divided. The colour is pale blue grey with well defined dun-black subrectangular marks. A median series passing as bars across the back, are broader than the interspaces. Costally 3 or 4 series of quincunciately arranged spots decreasing in size from above downwards pass along the whole body, the uppermost alternating with the vertebral series.

Zamenis gemonensis.

A single specimen from Gotwand, North of Shushtar, S. Persia, accords with variety *asianus* (Boettger). This variety has not hitherto been recorded further South than Palestine.

Costals.										
Two heads lengths behind head.	Midbody.	Two heads lengths before vent.	Ventrals.	Anal.	Subcaudals	Præoculars.	Postoculars.	Temporals.	Supralabials.	Supralabials touching eye.
17	19	15	198	2	?	1	2	2	8	3rd, 4th and 5th.

The 3rd supralabial is divided, the upper part touching the eye. It is blackish with rather indistinct median rose-coloured streaks on each scale, more noticeable in the hinder part of the body. The belly is blackish-plumbeous, heavily mottled with rose-pink. The posterior borders of the supralabials are black.

Contia decemlineata.

Ten specimens, the longest (*viz.* No. 6) measuring 1 foot 8½ inches, the tail 5¼ inches.

	Costals.*											
No. of specimen.	2 heads lengths after head.	Midbody.	2 heads lengths before vent.	Ventrals.	Anal.	Subcaudals.	Loreal.	Præoculars.	Postoculars.	Temporals.	Labials.	Labials touching eye.
1	17	17	15	168	2	91	1	1	2	1	7	3rd and 4th.
2	17	17	15	159	2	86?	1	1	2	1	7	3rd and 4th.
3	17	17	15	169	2	78	0*	1	2	1	7	3rd and 4th.
4	17	17	15	169	2	75	1	1	2	1	7	3rd and 4th.
5	17	17	15	149	2	86	1	1	2	1	7	3rd and 4th.
6	17	17	15	174	2	78	1	1	2	1	7	3rd and 4th.
7	17	17	15	158	2	85	1	1	2	1	7	3rd and 4th.
8	17	17	15	169	2	68	1	1	2	1	7	3rd and 4th.
9	17	17	15	152	2	91	1	1	2	1	7	3rd and 4th.
10	7	7	?	171	2	81	1	1	2	1	7	3rd and 4th.

* The loreal is confluent with the nasal on both sides.

The reduction of rows from 17 to 15 is occasioned by a confluence of the 3rd and 4th rows above the ventrals. The largest specimen is nearly uniform brown, but the spots seen in the younger specimens are obscurely visible when scrutinised. The younger specimens are specked with small blackish spots which show a great tendency to occur in pairs or triplets side by side. In the posterior part of the body and tail these spots become rearranged in longitudinal interrupted lines. Hitherto I believe this species has been known from Syria only, but there is nothing surprising in the extension of habitat to Persia as the Fauna of Syria is essentially that of the valley of the Euphrates and Tigris.

Contia persica.

Five specimens.

No. of specimen.	COSTALS.			Ventrals.	Anal.	Subcaudals.	Præoculars.	Postoculars.	Temporals.	Labials.	Lab. touching eye.
	2 heads lengths after head.	Midbody.	2 heads lengths before vent.								
1	15	15	15	202 ?	2	66	1	1	1	7	3rd and 4th.
2	15	15	15	213	2	63	1	1	1	7	3rd and 4th.
3	15	15	13	201	2	78	1	1	1	7	3rd and 4th.
4	15	15	13	200	2	67	1	1	1	7	3rd and 4th.
5	15	15	15	20	2	64	1	1	1	7	3rd and 4th.

In specimens 3 and 4 the reduction of rows from 15 to 13 is brought about by a coalescence of the 3rd and 4th or 4th and 5th rows above the ventrals. The præfrontal owing to the absence of a loreal meets the 2nd supralabial in all the specimens.

In No. 3 there is a black well defined collar, and two narrower less defined bands on the head, one across between the eyes, the other across the middle of the parietals. In the other specimens no such bands can be distinguished but the whole of the head between the limits of these three bands is quite black.

Contia coronella.

Eight specimens, the largest (No. 1) 1 foot 2 inches, tail 2½ inches.

No. of specimens.	Costals. 2 heads lengths after head.	Costals. Midbody.	Costals. 2 heads lengths before vent.	Ventrals.	Anal.	Subcaudals.	Loreals.	Præoculars.	Postoculars.	Temporals.	Labials.	Lab. touching eye.
1	15	15	13	151	2	37	1	1	2	1	7	3rd and 4th.
2	15	15	13	154	2	34?	1	1	2	1	7	3rd and 4th.
3	15	15	13	134	2	44	1	1	2	1	7	3rd and 4th.
4	15	15	13	134	2	45	1	1	2	1	7	3rd and 4th.
5	15	15	13	136	2	43	1	1	2	1	7	3rd and 4th.
6	15	15	13	139	2	49	1	1	2	1	7	3rd and 4th.
7	15	15	13	154	2	39	1	1	2	1	7	3rd and 4th.
8	15	15	13	137	2	..	1	1	2	1	7	3rd and 4th.

The reduction of scales from 15 to 13 is due to a confluence of the 3rd and 4th rows above the ventrals.

The constancy of the costal rows in the genus *Contia* as far as I know it, is such that I cannot help thinking that more than one (possibly three) distinct species are summed up by Mr. Boulenger under the title *coronella* (*vide* Catalogue Vol. II, p. 264). Hitherto it has only been recorded from Syria, but the extension of the habitat to the further limit of the Euphrates-Tigris basin is only in consonance with other forms.

Series B—OPISTHOGLYPHA.

Subfamily—DIPSADOMORPHINÆ.

Tarbophis tessellatus, spec. nov.

A single specimen, in 5 fragments. Length about 18 inches?

Description. *Costals.*—2 heads lengths after head 21, midbody 21, 2 heads lengths before the vent 17. *Absorption.*—From 21 to 19 uncertain; from 19 to 17 the 8th and 9th rows coalesce on the right side. Vertebral not enlarged. Ultimate row enlarged. Keels absent. Apical pits single, and very evident. *Ventrals.*— 243, very distinctly angulate. *Anal* entire. *Subcaudals* 75 divided.

Rostral in contact with 6 shields, the naso-rostral sutures longest. *Internasals.*—The suture between the fellows half that between the præfrontal fellows ; two-thirds the internaso-præfrontal suture. *Præfrontals.*—Suture between the fellows greater than the præfronto-frontal sutures ; in contact with internasal, postnasal (very slightly), loreal, præocular, and frontal. *Frontal.*—Touches 8 shields, the fronto-supraocular sutures rather the longest. Length greater than distance to the end of the snout,—subequal to parietals. *Supraoculars.*—Length and breadth about three-quarters that of the frontal. *Nasals* divided, equal to or rather longer than loreal, in contact with the 1st and 2nd supralabials. A suture from the nostril to the 1st supralabial. *Loreal.*—One, touching the eye below the præocular. *Præocular.*—One, touching the frontal. *Postoculars.*—Three. *Temporals.*—Scale-like, three superposed anteriorly. *Supralabials.*—8, the 3rd, 4th and 5th touching the eye, 6th longest. *Posterior sublinguals.*—Three-quarters the anterior, in contact with the 4th and 5th (or 5th ?) infralabials; the fellows quite separated. *Infralabials.*—The 5th is the largest of the series, and in contact with three scales behind. The suture between the 1st subequal to that between the anterior sublinguals. *Pupil* vertical. *Colour.*—Greyish with three series of large well defined blackish spots. The median form cross bars, and the lateral alternate as vertical bars passing down as far as the angulation of the ventrals. Belly between angulation of ventrals black, the angulation lightly streaked.

There are 46 cross bars on the body, and they involve about as many scales (2 to 3) in the length of the snake as the intervals. Many of these do not meet their fellows accurately on the spine occasioning oblique, or divided bars. Head neutral tint, the lower half of the supralabials greyish.

Psammophis schokari.

Two specimens.

The costals 2 heads lengths behind head are 17, at midbody 17, and 2 heads lengths before the vent 11. *Absorption* agrees with that of other specimens I have examined. The first two steps from 17 to 15, and from 15 to 13 occur very close together, and may be reversed. The 3rd and 5th rows above the ventrals are absorbed into the rows above or below. From 13 to 11 the 4th is absorbed.

Supralabials.—9, the 5th and 6th touching the eye in both. No. 1, *Ventrals.*—175. *Subcaudals.*—124. No. 2, *Ventrals.*—175. *Subcaudals.*—119.

Family.—VIPERIDÆ.

Sub-family.—VIPERINÆ.

Echis carinatus.

Three specimens.

In No. 1, the costals 2 heads lengths from the head are 25, at midbody 31, and 2 heads lengths before the vent 21. Ventrals and subcaudals 180 and 36.

In No. 2 the costals are 29—32—23, and the ventrals and subcaudals 177 and 32.

In No. 3 I omitted to record any lepidosis.

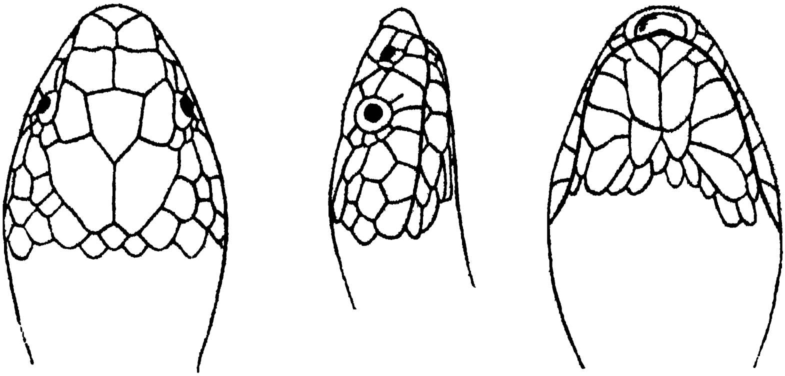
Vipera lebetina.

A somewhat tattered skin of this species. The scales in midbody 25? Ventrals 175. Tail absent. The head was attached to the skin, and the lepidosis typical.

Atractaspis wilsoni, spec. nov.

Two specimens, one very badly damaged about the head, is 2 feet 8½ inches in length, the tail 4 inches.

Description. *Costals.*—2 heads lengths from head 23 (21 in one), in midbody 23, 2 heads lengths before the vent 19. The reduction of rows from 23 to 21 and from 21 to 19 is due to the absorption of the 3rd row above the ventrals into the 2nd or 4th, both steps occurring very close together. Vertebrals not enlarged. Ultimate row enlarged, more than twice the breadth of the median costals. *Keels.*—Very obtuse in the basal half of some median rows posteriorly. *Ventrals* in No. 1, 197; in No. 2, 180. *Anal* divided. *Subcaudals.*—In No. 1, 41, the 1st and 2nd entire. In No. 2, 47, the 1st to 10th and last entire, the rest divide. *Rostral.*—Touches 6 shields, the rostro-internasal sutures as long as the rostro-nasal and rostro-labial taken together. Portion visible above equals its distance to the frontal. *Internasals.*—The suture between the fellows three-quarters that between the præfrontal fellows; about half the internaso-præfrontal sutures. *Præfrontals.*—The suture between the fellows equal to the præfronto-frontal



Atractaspis wilsoni (× 2).

sutures; in contact with internasal, postnasal (slightly), upper præocular, supraocular and frontal. *Frontal.*—Touches six shields. The fronto-supraocular sutures rather the longest. *Nasals.*—Longer than the præoculars; in contact with the 1st and 2nd supralabial and both præoculars. *Nostril* peculiar, with a small scale inferiorly inside the aperture; a suture runs from the nostril to the back of the 2nd supralabial. *Præoculars.*—Two, elongate, and sub-equal. * *Postoculars.*—Three decreasing in size from above downwards. *Temporals.*—Two superposed anteriorly, the lower larger. *Supralabials.*—7, the 3rd and 4th touching the eye; 3rd, 4th and 5th highest, the 7th longest. *Infralabials.*—5. The 5th largest, quite separated from the labial margin by small marginal scales, the anterior of which also partially separates the 4th from the tip; the 4th and 5th are very broad. *Sublingual* in contact with 5 infralabials. Eye with round pupil.

A well developed grooved fang. *Colour.*—Uniform tarry-black above, plumbeous-black on the belly.

I have much pleasure in conferring Lieutenant Wilson's name upon this species.

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* On the right side in one specimen a suture passes from the eye only partially dividing the 3rd labial, and suggesting that the lower præocular is derived from a division of this shield.

DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA

BY

E. MEYRICK, B.A., F.R.S., F.Z.S.

VIII.

(Continued from page 638 of this Volume.)

ELACHISTIDÆ.

I have now satisfied myself that the family *Elachistidæ* as hitherto understood is heterogeneous in origin, and propose to restrict it to those forms which have long recurved sickle-shaped palpi, similar to those of the *Gelechiadæ* and *Œcophoridæ*, to which they are really akin. The following genus is particularly interesting as furnishing, in my judgment, a good connecting link between the *Œcophoridæ* and *Elaschistidæ*, though properly referable to the latter family.

Promalactis, n. g.

Head with appressed scales; tongue developed. Antennæ ⅘, in ♂ moderately (1) strongly (4) ciliated, basal joint elongate, with fugitive pecten. Labial palpi long or very long, recurved, second joint beneath with tolerably appressed or rather rough scales, terminal joint nearly or quite as long as second, slender, acute. Maxillary palpi rudimentary. Posterior tibiæ clothed with hairs above. Forewings with 1b shortly furcate, 7 and 8 stalked, 7 to costa, 11 from middle of cell. Hindwings under 1, elongate-lanceolate or sometimes linear-lanceolate, cilia 2-4; 2-7 separate, 3 considerably before angle of cell, 6 and 7 somewhat divergent, or rarely 6 absent (*thiasitis*).

Type *P. holozona.* To this genus belong also *isopsslia*, Meyr., and *semantris*, Meyr., wrongly attributed to *Epicallima*, and I now describe twelve other species. They are handsome insects, orange with white or metallic markings.

Promalactis callimetalla, n. sp.

♀. 13 mm. Head dark shining bronze. Palpi very long, orange yellow, terminal joint black, tip whitish. Antennæ black ringed with white, apical fourth white except extreme tip. Thorax shining yellow, Abdomen dark fuscous. Forewings elongate, rather narrow, costa gently arched, apex obtuse, termen very obliquely rounded; bright deep yellow; five bright violet-golden-metallic narrow fasciæ edged with black, first basal, second at ¼, dilated towards costa, third median, approximated and connected with second on dorsum, space between these deep orange except towards costa, fourth from ⅔ of costa to before tornus, irregular, connected in middle with third by a slender blackish bar, above which the space between them is deep orange except towards costa, fifth terminal, broadest towards apex, space between this and fourth deep orange on tornus: cilia pale orange, base deep orange, above terminal fascia and on tornus grey. Hindwings lanceolate, grey irrorated with dark fuscous, appearing dark grey; cilia dark grey.

Palni hills (Campbell); one specimen.

Promalactis thiasitis, n. sp.

♂♀. 8—9 mm. Head and thorax bronzy-ochreous-orange, forehead broadly white. Palpi moderately long, ochreous, second joint black towards apex, terminal joint white with black apical band. Antennæ white ringed with dark fuscous, ciliations in ♂ 1. Abdomen grey, anal tuft whitish-ochreous. Forewings elongate-lanceolate; ochreous-orange; markings white, edged with scattered black scales; a slender almost basal oblique transverse streak; a narrow streak from beneath costa at ¼ to dorsum before middle; a rather narrow somewhat angulated fascia at ⅗, interrupted in middle; a moderate apical spot: cilia ochreous tinged with grey, greyer towards tornus, with scattered black specks. Hindwings with vein 6 absent, cilia 4; grey with a slight brassy tinge, thinly scaled and pellucid towards base; cilia light grey.

N. Coorg, 3,500 feet (Newcome); Madulsima, Ceylon (Pole, Fletcher); in May and June, four specimens. This species may ultimately require generic separation on the neuration of hindwings, but as it is otherwise nearly allied to the rest, I do not think it necessary at present.

Promalactis synclina, n. sp.

♂♀. 9—10 mm. Head bronzy, face pale shining bronze, forehead broadly white. Palpi long, deep ochreous, terminal joint white mixed with black. Antennæ white ringed with black, ciliations in ♂ 1. Thorax deep yellow-ochreous. Abdomen grey. Forewings elongate, narrow, costa gently arched, apex pointed, termen extremely obliquely rounded: light shining orange, basal area up to first line deep yellow-ochreous; a moderate white line from ¼ of costa to beyond middle of dorsum, edged anteriorly with black irroration; a fascia of black irroration from ⅔ of costa to tornus, triangularly dilated dorsally, followed on costa by a small white spot; an apical patch of black irroration; cilia yellow, towards base sprinkled with black, on tornus grey. Hindwings grey, thinly scaled at base; cilia grey.

Nilgiris, 3,500 feet (Andrews); N. Coorg, 3,500 feet (Newcome); in May and June, two specimens. Very like *parasceucta*, but forewings more pointed and hindwings narrower, first line black-margined anteriorly instead of posteriorly.

Promalactis parasceucta, n. sp.

♀. 11—14 mm. Head dark fuscous, face yellowish, forehead broadly yellow-whitish. Palpi very long, yellow-ochreous or fulvous, terminal joint black sprinkled with white. Antennæ white ringed with black. Thorax deep yellow-ochreous. Abdomen grey. Forewings elongate, narrow, costa gently arched, apex round pointed, termen very obliquely rounded; bright deep yellow-ochreous; two white lines, first edged posteriorly and second anteriorly with black irroration, first from ¼ of costa to beyond middle of dorsum, second from ⅗ of costa to ¾ of dorsum, dilated towards costa, angulated and interrupted in middle, the angle connected by a streak of blackish irroration with tornus; space included between these lines suffused with brown; an apical patch of blackish irroration: cilia yellow, towards base deeper with scattered black scales, on tornus grey. Hindwings rather dark grey; cilia grey.

Nilgiris, 6,000 feet (Andrews); N. Coorg, 3,500 feet (Newcome); from March to May, seven specimens.

Promalactis halicylsta, n. sp.

♂. 15—16 mm. Head white, sides of face light ochreous. Palpi very long, white, second joint with rather rough projecting scales beneath, lower half brownish-ochreous sprinkled with blackish, terminal joint sprinkled with black. Antennæ white ringed with blackish, ciliations 2. Thorax ochreous-yellow, sometimes centrally suffused with white. Abdomen grey, apex whitish-ochreous. Forewings elongate, narrow, costa gently arched, apex acute, termen extremely obliquely rounded; ochreous-yellow; a fine white oblique transverse line almost at base, not reaching costa, edged anteriorly with blackish irroration; a fine white line from before ¼ of costa to about middle of dorsum, edged posteriorly with blackish irroration, connected on dorsum, by a white streak edged above or sometimes wholly suffused with black irroration, with a slender white streak partially irrorated with blackish from dorsum beyond middle to ⅝ of disc, where it meets an inwardly oblique streak of dark fuscous suffusion from tornus; some dark fuscous irroration along termen: cilia ochreous-yellow. Hindwings grey, thinly scaled and pellucid towards base; cilia pale grey, becoming very pale yellowish at base.

Palni Hills, 6,000 feet (Campbell), two specimens.

Promalactis crenopa, n. sp.

♀. 14 mm. Head bronzy fuscous, face pale shining bronze, forehead broadly white. Palpi very long, fulvous, second joint infuscated above, terminal joint blackish, base and apex white. Antennæ white ringed with black. Thorax shining orange-bronze. Abdomen grey. Forewings elongate, narrow, costa gently arched, apex round pointed, termen very obliquely rounded; deep orange; a short white streak near base of dorsum; a white streak from beneath costa at ¼ to before middle of dorsum, edged with a few black scales on both sides; a white transverse spot from costa before ⅔, edged irregularly with black irroration, and an oblique white black edged streak from dorsum at ⅔, united in disc by black irroration so as to form an irregularly angulated fascia; the two streaks are connected along dorsum by a strong streak of black-irroration; a small apical patch of black irroration, extended as a slender irregular streak along termen to tornus, including a white dot on middle of termen: cilia orange, on tornus dark grey. Hindwings dark grey, cilia grey.

Palni Hills, 6,000 feet (Campbell); one specimen.

Promalactis amphicopa, n. sp.

♀. 11 mm. Head and thorax orange-bronze, face pale orange, forehead broadly shining white. Palpi very long, fulvous-orange, terminal joint suffused with dark fuscous. Antennæ white ringed with black. Abdomen grey. Forewings elongate, narrow, costa gently arched, apex round-pointed; termen extremely obliquely rounded; deep orange; markings silvery-white, finely edged with black irroration ; a slender almost basal oblique transverse streak, not reaching costa ; a slender somewhat curved fascia from beneath costa at ¼ to ⅖ of dorsum; a slender very oblique curved streak from dorsum beyond middle, its apex almost reaching apex of a short erect streak from tornus ; a transverse spot from costa beyond middle ; an irregular streak along termen from above tornus to apex, broader upwards : cilia bronzy-orange, on tornus grey. Hindwings grey ; cilia light grey.

Khasi Hills, in September : one specimen.

Promalactis holozona, n. sp.

♂ ♀. 12-13 mm. Head bronzy, back of crown bronzy-orange, forehead and lower part of face suffused with whitish. Palpi very long, ochreous-orange, terminal joint suffused with dark fuscous. Antennæ white ringed with black, ciliations in ♂ 1. Thorax bronzy-orange. Abdomen dark grey, apex ochreous-yellowish. Forewings elongate, narrow, costa slightly arched, apex obtuse, termen very obliquely rounded ; shining orange ; four slender silvery-white fasciæ, more or less strongly edged with black suffusion, first oblique, almost basal, not reaching costa, second from before ⅓ of costa to middle of dorsum, third from before ⅔ of costa to tornus, dilated on costa, sending a fine branch from below middle to dorsum at ⅔, fourth terminal, from apex to tornus : cilia orange, beneath tornus and on a costal patch before apex grey. Hindwings rather dark brozny-grey ; cilia grey.

N. Coorg, 3,500 feet (Newcome) ; in August, three specimens.

Promalactis clinometra, n. sp.

♂ ♀. 11-12 mm. Head orange-bronze, face mixed with pale silvery-bluish, anterior half of crown white. Palpi very long, whitish, externally irrorated with blackish. Antennæ white, ringed with blackish, ciliations in ♂ 1. Thorax bronzy-orange. Abdomen brownish-ochreous. Forewings elongate-lanceolate, bronzy-orange ; markings shining white, edged with blackish irroration ; a slender fascia almost at base, not reaching costa ; a slender transverse fascia before ⅓, reaching from dorsum ⅔ across wing ; a slender straight fascia from dorsum before tornus to ⅔ of costa, interrupted in middle, dilated and not margined towards costa ; a small apical spot : cilia bronzy-ochreous, towards tornus greyer, with some black specks. Hindwings in ♂ grey, in ♀ dark grey, rather thinly scaled towards base, in ♂ with oval transparent patch beneath cell near base ; cilia grey.

Ceylon, probably at low level (Pole) ; two specimens.

Promalactis isidora, n. sp.

♂. 9 mm. Head shining bronzy-grey sprinkled with whitish. Palpi long blackish. Antennæ black ringed with white ciliations 1. Thorax shining, orange-bronze. Abdomen light grey, apex whitish-ochreous. Forewings elongate, very narrow, costa slightly arched, apex acute, termen faintly sinuate, extremely oblique ; orange-bronze, becoming orange-fulvous towards apex ; markings shining white, edged with black ; median and subdorsal dots almost at base ; three short slender oblique streaks from dorsum ; three small irregular marks above fold before these respectively ; an oblique mark beneath costa before middle ; an oblique mark from costa beyond middle, and a small spot beyond and beneath apex of this ; a dot on dorsum before tornus ; a moderately large blackish spot on costa about ¾ ; a rather elongate apical spot, and another on termen above tornus : cilia light ochreous, basal half orange-fulvous. Hindwings grey ; cilia light grey.

Khasi Hills, in March ; one specimen.

Promalactis epistacta, n. sp.

♂ ♀. 12-14 mm. Head bronzy-ochreous. Palpi very long, bronzy-orange, terminal joint more or less suffused with blackish, tip white. Antennæ white ringed with black, ciliations in ♂ 1. Thorax shining orange-bronze. Abdomen dark grey. Forewings elongate, narrow, costa gently-arched, apex round-pointed, termen very obliquely rounded ; ochreous-orange, dorsal area and a patch on middle of costa suffused with ferruginous ; markings silvery-white, suffusedly edged with black irroration ; two dots transversely placed almost at base ; a subdorsal series of three short oblique marks ; a longitudinal dash in disc near base ; two small round spots above fold, second beneath middle ; a dot on dorsum before tornus, connected by blackish suffusion with second of these ; a small spot on middle of costa, and another beneath and rather beyond it ; a small spot at apex, one or termen above tornus, a dot between these, and another on costa before apex, a small spot of blackish scales on costa at ¾ : cilia ochreous-yellowish, basal third ochreous-orange, beneath tornus grey. Hindwings and cilia grey.

Khasi Hills, in September ; nine specimens.

Promolactis spintheritis, n. sp.

♂ ♀. 14-15 mm. Head and thorax bronze. Palpi very long, fulvous, terminal joint more or less suffused with blackish, tip white. Antennæ white ridged with black, ciliations in ♂ 4. Abdomen dark grey. Forewings elongate, narrow, costa gently arched, apex pointed, termen extremely obliquely rounded; orange-ochreous almost wholly suffused with deep ferruginous ; markings shining violet-white, edged with black ; median and subdorsal dots almost at base ; a fine longitudinal dash in disc near base ; three fine oblique streaks from dorsum to fold, first united with a reverse oblique streak in disc to form an acute angle ; a dot on dorsum before tornus ; a small oblique spot on middle of costa beneath which is sometimes a dot in disc ; three elongate marks along termen, third apical and largest ; cilia light yellow-ochreous, basal half ferruginous-fulvous. Hindwings and cilia dark grey.

Khasi Hills, in October ; ten specimens.

GRACILARIADÆ

In a recent paper (Proc. Linn. Soc. N. S. Wales, 1907, pp. 47—68) I recast the classification of *Gracilaria* and its immediate allies, and I now give an arrangement of the Indian species on the same system

Lithocolletis triarcha, n. sp.

♀. 5 mm. Head bronzy-ochreous mixed with white, face white. Palpi white; maxillary palpi minute, distinct, porrected. Antennæ whitish spotted with dark grey. Thorax bronzy-ochreous, with a rather broad white median transverse bar. Abdomen grey, beneath whitish-ochreous. Legs white, banded with dark fuscous irroration. Forewings lanceolate; bronzy-ochreous; an extremely short white median basal streak, edged with black beneath, three narrow rather inwards-oblique white fasciæ, finely edged with black irroration anteriorly, and with a few black scales in disc posteriorly, very slightly angulated near costa; from third fascia above middle proceeds a fine white downwards-curved streak to costa just before apex, edged beneath with black irroration: cilia bronzy-ochreous, above apex with a white patch, on upper part of termen irrorated with black towards base, towards tornus pale grey. Hindwings pale grey; cilia whitish-grey.

Pusa, Bengal; one specimen, bred in August from cotton (*Gossypium*) (Maxwell Lefroy.)

Epicephala, Meyr.

The rough head is not always a well-marked character, the hairs of the crown being sometimes loosely appressed. The straight palpi are a good character, in all species except *flagellata*, in which they are somewhat curved. The species are closely allied and often similar.

Epicephala chalybacma, n. sp.

♂. 9 mm. Head ochreous-whitish mixed with grey. Palpi whitish, second joint externally with a dark fuscous median longitudinal line. Antennæ whitish-grey. Thorax grey. Abdomen dark grey, beneath ochreous-whitish with lateral series of oblique dark fuscous lines. Legs ochreous-whitish, anterior and middle pairs longitudinally lined with blackish, posterior tarsi obliquely banded with dark fuscous. Forewings very narrowly elongate, short-pointed, apex obtuse; grey, veins more or less distinctly marked with fine black lines; two indistinct oblique lines of dark fuscous scales from costa at $\frac{1}{5}$ and $\frac{4}{5}$ and a slender very oblique streak from tornus indicated by blackish margins; a rather oblique transverse bluish-silvery-metallic line near before apex, edged with dark fuscous; blackish anteapical and apical spots on costa beyond this: cilia dark grey, round apex, whitish with two black lines, inner metallic-bluish at apex. Hindwings dark fuscous; cilia dark grey.

Peradeniya, Ceylon, in September (Green); one specimen.

Epicephala exetastis, n. sp.

♂. 14 mm. Head whitish. Palpi whitish, mixed with dark fuscous externally. Antennæ grey. Thorax whitish, sides fuscous. Abdomen grey, apex whitish-ochreous, beneath whitish with oblique dark fuscous rings. Legs whitish, ringed with blackish-grey. Forewings very narrowly elongate, moderately pointed, apex round-pointed; light fuscous irrorated with dark fuscous; a slender whitish streak along dorsum from base to tornus; an oblique whitish streak from beyond middle of this, and two parallel oblique whitish streak from tornus, not reaching half across wing; short oblique whitish strigulæ from costa before and beyond middle, and five whitish cloudy dots or marks on costa between these and metallic line; some suffused whitish irroration in disc beneath these; a nearly straight transverse silvery-metallic line at ⅞, apical are a brownish-ochreous, edged beneath by a whitish wedge shaped mark reaching apex and above by a shorter similar mark, between these anteriorly is a transverse spot of blackish suffusion: cilia grey, round apex whitish with a fine black subbasal line, edged anteriorly with silvery-metallic at apex, and a posterior blackish apical hook. Hindwings and cilia grey.

Maskeliya, Ceylon, in July (Pole); one specimen.

Epicephala frenata, n. sp.

♂ ♀. 9-10 mm. Head white. Palpi dark fuscous, white towards base and apex. Antennæ grey. Thorax fuscous with white central stripe. Abdomen grey, beneath ochreous-whitish with lateral series of oblique grey lines, apex ochreous-whitish. Legs whitish spotted with dark grey. Forewings very narrowly elongate, short-pointed, apex round-pointed; rather dark fuscous; a white streak along dorsum from base to middle of termen, attenuated posteriorly, upper edge emitting a short oblique streak before middle of wing, and a pair of longer oblique streaks from tornus reaching half across wing, before which the streak itself is cut by a fine inwards-oblique line of ground colour; three usually very short oblique white streaks from costa before and beyond middle and at ¾, sometimes reduced to dots, second sometimes longer; a bent silvery-metallic transverse line at ⅚, area preceding this more or less irrorated with whitish and blackish; apical area ochreous-fuscous with a spot of dark fuscous suffusion anteriorly, edged beneath by a wedge-shaped white mark, and above by a shorter similar mark not reaching apex: cilia grey, round apex white with a fine black subbasal line, at apex with a dark fuscous bar. Hindwings rather dark grey; cilia grey.

Puttalam and Ambulangoda, Ceylon, in November, February, and March (Pole, Fletcher); nine specimens. Near *albistriatella*, Turn., from Queensland hitherto placed in *Acrocercops* on account of the smoother head, but by the palpi properly an *Epicephala*), but differs by presence of the median branch of dorsal streak, and less developed costal streaks.

Epicephala flagellata, n. sp.

♀. 9 mm. Head white. Palpi somewhat curved, white, second joint suffused with grey except towards base. Antennæ grey. Thorax white, shoulders brownish. Abdomen grey, beneath whitish with lateral series of oblique fuscous stripes, anteriorly darker. Legs white ringed with blackish-grey, anterior pair suffused with dark grey. Forewings very narrowly elongate, short-pointed, obtuse, light ochreous-brown; a rather narrow white streak along dorsum from base to tornus; moderate oblique white streaks from costa before and beyond middle, reaching nearly half across wing; two strongly curved parallel transverse fine white lines about ⅘, preceded on lower half by an oblique white streak; beyond these are white costal and terminal marks not reaching apex, and a small black central dot before apex: cilia grey, round apex white with two fine black lines, at apex with a bar of blackish irroration. Hindwings and cilia grey.

Peradeniya, Ceylon, in March (Green); one specimen. Also similar to *Albistriatella*, which however has the first curved posterior line represented by two straight streaks placed at an acute angle.

Epicephala trigonophora, Turn.

(*Ornix trigonophora*, Turn., Trans. Roy. Soc. S. Austr. 1900, 21.)

Maskeliya, Ceylon, in August (Alston); one specimen. Comparing this with my single Queensland specimen, I am unable to find any distinction.

Epicephala albifrons, Stt.

(*Ornix albifrons*, Stt., Trans. Ent. Soc. Lond. V. (n. s.), 122.)

N. Coorg., 3,500 feet, in March (Newcome); one specimen, which seems to be identical specifically with Stainton's example from Calcutta.

Epicephala stauropa. n. sp.

♂. 10 mm. Head white. Palpi white, externally mixed with fuscous. Antennæ dark grey, obscurely pale-ringed. Thorax white, shoulders fuscous. Abdomen grey, beneath whitish with lateral series of oblique fuscous stripes. Legs white banded with blackish, posterior tibiæ greyish. Forewings very narrowly elongate, moderately pointed, apex round-pointed; pale fuscous irrorated throughout with dark fuscous; three moderately broad oblique white streaks from dorsum reaching half across wing, first extended along dorsum to base, its apex irregularly expanded, third slightly curved and followed closely by a parallel white line; three short oblique wedgeshaped white streaks from costa before and beyond middle, and at ¾; beneath the two last of these are short blackish marks; a curved transverse silvery-metallic line at ⅚; apical area beyond this fulvous, edged beneath by a white mark, and including a central cross-shaped black dot; a small silvery-metallic apical dot: cilia grey, round apex white with a black subbasal line. Hindwings grey; cilia pale grey tinged with ochreous.

Khasi Hills, in September: one specimen.

Epicephala calasiris, n. sp.

♀. 10 mm. Head white. Palpi white, externally mostly dark fuscous except towards base. Antennæ dark grey, obscurely pale-ringed. Thorax dark, fuscous. Abdomen dark fuscous, beneath ochreous with oblique dark fuscous bands. Legs white banded with blackish, posterior tibiæ greyish. Forewings very narrowly elongate, short-pointed, apex round-pointed; dark fuscous; a moderate white streak along basal ⅔ of dorsum, a moderate oblique white streak from dorsum beyond middle, not reaching half across wing; some interrupted white marks representing a double oblique streak from tornus; three moderate oblique white streaks from costa before and beyond middle, and at ¾, reaching ⅓ across wing, first shortly produced along costa towards base; a somewhat oblique transverse leaden-metallic line at ⅘, narrowly edged with white anteriorly and followed at extremities by small white spots; apical area suffused with fulvous-ochreous with a small black central spot: cilia grey, round apex white with two blackish lines. Hindwings dark grey; cilia grey.

Khasi Hills, in September; one specimen.

Phrixosceles, n. g.

Head smooth; tongue developed. Antennæ over 1, filiform, simple, basal joint moderately elongate, without pecten. Labial palpi long, curved, slender, smooth-scaled, terminal joint rather shorter than second, pointed. Maxillary palpi short, slender, filiform, porrected. Middle and posterior tibiæ and two or three joints of tarsi above with rough projecting bristly scales. Forewings with lower fork of vein 1b obsolete, 2 and 3 obsolete towards origin, 4 and 5 connate, 7 to costa, 8 absent, 11 from near base. Hindwings ½, linear, cilia 6; 2-7 separate, 6 and 7 closely approximated.

Type *P. trochosticha.* Differs from *Acrocercops* in having the middle tibiæ and two or more joints of both middle and posterior tarsi bristly, whereas in that genus only the posterior tibiæ and first joint of tarsi are so.

Phrixosceles literaria, n. sp.

♂. 8 mm. Head, palpi, and thorax white. Antennæ white, finely dotted with dark fuscous. (Abdomen broken.) Legs white spotted with blackish. Forewings very narrowly elongate, parallel-sided, short-pointed; white; five irregular blackish spots on anterior $\frac{2}{5}$ of costa, first two small and connected with dorsum by fine fuscous lines, others longer and reaching more than half across wing; three rather oblique blackish marks from dorsum about middle, reaching half across wing, central one longer; two small blackish spots on costa beyond middle, and a fine oblique strigula from dorsum opposite; a blackish ring in disc at $\frac{3}{4}$; a fine transverse blackish line midway between this and apex, preceded by a short oblique dorsal strigula; a small brownish apical spot finely edged anteriorly with black: cilia white, beneath tornus greyish, round apex with base brownish edged by some blackish specks. Hindwings rather dark grey; cilia light grey.

Maskeliya Ceylon in January (Pole); one specimen.

Phrixosceles campsigrapha, n. sp.

♂. 9 mm. Head, palpi, and antennæ white. Thorax white, shoulders yellowish. (Abdomen broken.) Legs white, banded with ochreous-yellowish. Forewings very narrowly elongate-lanceolate, very long pointed; white; four pairs of fine transverse dark grey lines edged with yellowish, first three pairs on anterior half of wing, third pair sinuate-angulated in middle, hardly oblique, entire, fourth beyond middle, oblique, filled up with ochreous-yellowish; beyond this the wing is pale yellow, with two white longitudinal subsinuate lines edged with blackish irrorations, and a short white dorsal streak beyond fourth fascia: cilia whitish-ochreous, towards tornus greyish, round apex with a blackish median line. Hindwings rather dark grey; cilia grey.

Maskeliya, Ceylon, in February (Pole); one specimen. Very like *P. trochosticha*, but antennæ wholly white, third fascia of forewings less oblique and sinuate-angulated instead of straight, an additional white dorsal streak beyond fourth fascia and legs banded with yellow instead of blackish.

Phrixosceles trochosticha, n. sp.

♂ ♀. 7-9 mm. Head and thorax whitish. Palpi white, second joint with a dark grey apical dot, and sometimes a few other grey scales towards base. Antennæ white, more or less distinctly spotted with grey. Abdomen light grey, beneath whitish. Legs white banded with blackish. Forewings very narrowly elongate-lanceolate, very long-pointed; white, often yellowish-tinged; four pairs of oblique transverse ochreous-yellow lines irrorated with black, first three pairs on anterior half of wing, third generally obsolescent towards dorsum, fourth beyond middle, more oblique, in one specimen strongly marked with black: beyond this the wing is ochreous-yellowish with two fine white longitudinal subsinuate lines edged with black irroration, sometimes terminated by a blackish apical dot or mark: cilia whitish, towards tornus greyish, round apex with base ochreous yellow and a black median line. Hindwings and cilia grey.

Khasi Hills, in March: six specimens.

Phrixosceles hydrocosma, n. sp.

♀. 9 mm. Head, thorax, and antennæ whitish. Palpi white, second joint with oblique blackish-grey subapical band. Abdomen grey, beneath white with lateral series of oblique grey stripes, last two segments laterally suffused with grey. Legs white, posterior tarsi ringed with blackish. Forewings very narrowly elongate, gradually narrowed posteriorly, apex obtuse; whitish, on dorsal half tinged with pale yellowish: markings ferruginous-ochreous; a series of short indistinct transverse strigulæ along costa; a series of oblique irregular strigulæ above dorsum and termen, tending to be connected into an irregular waved streak; a median fascia of two parallel curved oblique striæ from dorsum not reaching costa; a roundish ochreous apical spot: cilia white, beneath tornus grey, round apex with a blackish subbasal and fuscous median line. Hindwings and cilia grey.

Khasi Hills, in November; one specimen.

Acrocercops, Wallgr.

Lord Walsingham has correctly pointed out that this is a prior name for *Conopomorpha*, Meyr.

Acrocercops stricta, n. sp.

♂. 6 mm. Head whitish, lower part of face grey. Labial palpi rather short, expanded with loose scales, white, second and terminal joints with black basal bands. Maxillary palpi expanded with loose scales, white banded with black. Antennæ dark grey, beneath whitish. Thorax blackish. Abdomen dark fuscous, beneath sharply banded with white. Legs white banded with blackish. Forewings narrowly lanceolate; grey closely irrorated with blackish; a small whitish spot on costa towards base; slender slightly oblique white fasciæ at ¼ and beyond middle, each with two or three separate black scales in disc; two approximated opposite pairs of small ill-defined whitish costal and dorsal spots posteriorly : an undefined white apical dot : cilia dark grey, beneath apex with a short subbasal dash of whitish suffusion. Hindwings dark grey ; cilia grey.

Maskeliya, Ceylon, in July (Pole) ; one specimen. The expanded maxillary palpi are exceptional.

Acrocercops urbana, n. sp.

♀. 9 mm. Head white. Palpi white, second joint with two dark grey rings, apical scales somewhat projecting, terminal joint with traces of a grey median ring. Antennæ light greyish, white towards base. Thorax white, anteriorly mixed with blackish. Abdomen grey, beneath white with median and apical black bands. Legs white ringed with black. Forewings very narrow-lanceolate ; white ; four rather oblique parallel fasciæ ; first almost basal, light yellow-browinsh, very undefined, second broad, blackish, third moderate, light brownish, becoming black on costa, fourth narrow, light brownish, mixed with black on costa ; between each pair of these fasciæ is a series of three small black dots, costal, discal, and dorsal ; a blackish apical patch, preceded by a slender oblique pale brownish streak, and some scattered blackish scales : cilia whitish-ochreous, round apex greyish with a black postmedian line, at apex with a white basal spot followed by blackish. Hindwings grey ; cilia light grey.

Khasi Hills, in October ; one specimen.

Acrocercops ordinatella, Meyr.

(*Gracilaria ordinatella*, Meyr., Proc. Linn. Soc. N. S. Wales, 1880, 145.)

Peradeniya, Ceylon, in June (Green) ; one specimen, exactly similar to my Australian examples.

Acrocercops quadrifasciata, Stt.

(*Gracilaria quadrifasciata*, Stt., Trans. Ent. Soc. Lond., (3rd Ser.), 295, pl. x, 5.)

Very close to the preceding and following species, but apparently distinct ; I have not obtained specimens.

Acrocercops geologica, n. sp.

♂ ♀. 6-7 mm. Head shining white. Palpi white, second joint with an ochreous-grey ring, terminal joint with three faint ochreous rings. Antennæ white, faintly ringed with ochreous. Thorax whitish-ochreous. Abdomen whitish. Legs white, faintly ringed with ochreous, middle tibiæ with grey apical band. Forewings very narrowly elongate-lanceolate ; pale shining ochreous ; five moderate rather oblique white fasciæ, very faintly edged with fuscous, and each marked with three fuscous dots or strigulæ, costal, discal, and dorsal, first fascia near base , a sixth white fuscous-edged fascia close before apex, contracted on termen : cilia pale grey mixed with whitish on termen, round apex dark fuscous towards base, with a white subbasal dot at apex. Hindwings rather dark grey ; cilia pale grey.

Maskeliya, Ceylon, in February (Pole) ; two specimens.

Acrocercops nitidula, Stt.

(*Gracilaria nitidula*, Stt., Trans. Ent. Soc. Lond., i. (3rd Ser.), 299, pl. x, 9.)

I do not possess this species.

Acrocercops terminaliæ, Stt.

(*Gracilaria terminaliæ*, Stt., Trans. Ent. Soc. Lond., i. (3rd Ser.), 298, pl. x, 8.)

Apparently allied to *cathedræa*, but I do not possess it. I note here that *Gracilaria falcatella*, Stt., Trans. Ent. Soc. V. (n. ser.), 121, does not belong to this group at all, but to the *Elachistidæ*.

Acrocercops cathedræa, n. sp.

♂. 8 mm. Head and thorax white. Palpi white, second joint with dark fuscous apical band. Antennæ grey, towards base white. Abdomen grey beneath white with dark fuscous rings. Legs white, banded with dark fuscous. Forewings very narrow, elongate-lanceolate; light ochreous-brown; five white fasciæ finely edged with black, first moderate, basal, enclosing a small spot of ground colour on costa, second rather broad, narrower on costa, outer edge angulated near dorsum, third beyond middle, moderate, oblique, abruptly dilated below middle so that posterior edge forms a quadrate dorsal expansion, fourth slender, oblique, more or less narrowly interrupted in middle, fifth anteapical, moderately broad, oblique, rather irregular: cilia pale greyish white on basal half at apex and on lower extremity of fifth fascia, with two incomplete black lines. Hindwings rather dark grey; cilia light grey.

Khasi Hills, in September and October; three specimens.

Acrocercops ortholocha, n. sp.

♀. 8-9 mm. Head and thorax shining white. Palpi white, second joint with grey apical band. Antennæ pale greyish, becoming white towards base. Abdomen pale grey, beneath white with grey rings. Legs white ringed with grey. Forewings very narrow, slightly widest near base, short-pointed; rather light yellowish-brown; four shining white fasciæ edged with black, slightly narrowed towards costa, first narrow, basal, other three moderately broad, fourth at ¾, not black-edged posteriorly, apical area black on costal half, including a white anteapical strigula from costa and a white apical dot; cilia pale greyish-ochreous, round apex whitish with a black basal line. Hindwings light grey; cilia pale greyish-ochreous.

Khasi Hills, in October; two specimens.

Acrocercops triplaca, n. sp.

♂. 12 mm. Head shining white. Palpi white, upper edge of second joint dark fuscous. Antennæ white, suffusedly spotted with grey. Thorax brown. Abdomen grey, beneath white ringed with dark fuscous. Legs white, banded with dark fuscous. Forewings very narrowly elongate, short-pointed, obtuse; rather dark brown; three shining white fasciæ, first towards base, broad, broadest on dorsum, second median, moderate, dilated towards dorsum, third towads apex, rather narrow, anteriorly rather convex, preceded by blackish suffusion; beyond this is a blackish longitudinal spot, terminated by a white apical dot: cilia brownish, with some whitish suffusion on lower extremity of third fascia, and a postmedian dark fuscous shade round apex. Hindwings and cilia grey.

Khasi Hills, in June ; one specimen.

Acrocercops triacris, n. sp.

♂. 8 mm. Head white. Palpi white, second joint with grey apical band, terminal joint suffused with grey anteriorly. Antennæ grey. Thorax white sides bronzy. Abdomen grey, beneath white with grey rings, apical tuft whitish-ochreous, at apex white. Legs white banded with grey. Forewings linear-lanceolate, acute ; golden-bronze ; markings shining white, strongly blackish-edged ; a triangular blotch on dorsum before middle, not quite reaching costa ; two fasciæ, broad on dorsum and strongly narrowed to costa, first at ⅖, second anteapical, not dark-margined posteriorly ; between these is a slender oblique streak from costa, reaching more than half across wing ; apical area beyond second fascia ochreous-yellow, apex itself black : cilia pale bronzy-greyish, at apex with base white followed by a fragment of a black line. Hindwings grey, cilia pale bronzy-greyish.

Maskeliya, Ceylon, in May (Pole) ; one specimen.

Acrocercops orbifera, n. sp.

♂ ♀. 13 mm. Head and thorax shining whitish (partly defaced). Palpi whitish, second joint with blackish apical band, terminal joint blackish above and beneath except towards base and apex. Basal joint of antennæ whitish above, dark fuscous beneath (rest broken). Abdomen fuscous, beneath silvery-white with slender fuscous rings. Legs white banded with dark fuscous. Forewings very narrow, slightly widest near base, apex long-pointed ; shining golden-bronze, base of dorsum narrowly white ; three shining yellowish-white fasciæ edged with black, very broad on dorsum and strongly narrowed towards costa, at about ⅓, ⅔, and before apex respectively ; between second and third a whitish black-edged strigula on costa, apex beyond third fascia black except a white apical dot : cilia grey, at apex with a black basal line. Hindwing rather dark grey ; cilia grey.

Palni Hills, 6,000 feet (Campbell) ; two specimens.

Acrocercops resplendens, Stt.

(*Gracilaria resplendens*, Stt., Trans. Ent. Soc. Lond., i, (3rd ser., 294, pl. x, 4).

Khasi Hills, in October and November, received in plenty. Before the anteapical blotch of forewings are two whitish dark-edged dots transversely placed ; these are omitted by Stainton both in his description and figure, but are always present, and are plainly visible in the type-specimen.

Acrocercops chrysargyra, n. sp.

♀. 9 mm. Head silvery-white, lower part of face brassy, back of crown golden-bronze. Palpi white. Antennæ grey. Thorax orange bronze, posterior half of patagia white. Abdomen greyish-ochreous, beneath white, with lateral series of oblique fuscous bars. Legs white banded with blackish. Forewings elongate-lanceolate ; bright golden-orange ; four somewhat rounded-triangular silvery-white black-edged dorsal blotches, reaching about ⅔ across wing, tipped with violet, their posterior margins raised into a transverse ridge ; a slender shining violet-silvery streak along basal third of costa, thence deflected almost to reach apex of second dorsal blotch. Latter portion black-edged; a shining pale violet black-edged dash above disc between second and third blotches, and another between third and fourth; violet black-edged dots on costa opposite third and fourth blotches; a silvery-white spot on costa just before apex, edged beneath with black: cilia grey, round apex bronzy-fulvous, at costal termination dark grey preceded by white. Hindwings dark grey; cilia grey.

Khasi Hills, in October; one specimen. A splendid insect; the maxillary palpi are shorter than usual, the bristles of posterior tibiæ longer: the ridge of raised scales on forewings are a peculiar character.

Acrocercops tetracrena, n. sp.

♀. 9 mm. Head white. Palpi white, second joint dark grey above and at apex, with scales angularly projecting beneath at apex, terminal joint with grey suffused submedian ring. Antennæ grey. Thorax bronzy-brown, with white central stripe. Abdomen grey, beneath white. Legs white, banded with blackish-grey. Forewing very narrowly elongate-lanceolate; bronzy-brown: four semioval white black-edged dorsal spots, not reaching half across wing, first and fourth smallest, first extended dorsally towards base; a fine white transverse strigula just before apex, surrounded with dark fuscous suffusion, dilated on costa: cilia fuscous, at apex with a black subbasal line followed by whitish suffusion. Hindwings rather dark grey; cilia grey.

Maskeliya, Ceylon, in October (Pole); one specimen.

Acrocercops castellata, n. sp.

♂. 10 mm. Head white. Palpi white, second joint grey towards apex. Antennæ grey, basal joint whitish, beneath dark fuscous. Thorax white, sides bronzy-fuscous. Abdomen grey, beneath white. Legs white, banded with blackish. Forewings very narrowly elongate-lanceolate; ochreous-brown, darker and bronzy-tinged on costal half; three silvery-white black-edged somewhat rounded triangular dorsal blotches, reaching more than half across wing, first about ⅓, irregularly extended along dorsum almost to base, second beyond middle, third towards apex; a white mark on apical portion of costa edged anteriorly by an oblique black strigula: cilia light brownish, towards tornus greyer. Hindwings rather dark grey; cilia light grey.

Maskeliya, Ceylon, in February (Pole); one specimen.

Acrocercops tricyma, n. sp.

♂♀. 7—9 mm. Head white. Palpi white, second joint dark fuscous above towards apex. Antennæ grey, in front whitish, basal joint white, beneath black. Thorax white, sides bronzy. Abdomen dark fuscous, beneath ochreous-whitish. Legs blackish ringed with white, tarsi white, posterior pair spotted with grey. Forewings narrowly elongate-lanceolate; ochreous bronze; a broad shining white dorsal streak from base, its upper edge from ¼ to beyond tornus forming three strong rounded-triangular black-edged prominences, reaching ⅔ across wing, the concavities between these almost reaching dorsum: a white black-edged dot on costa at ¾; a fine white black-edged oblique transverse streak before apex: cilia white, towards tornus grey, beneath apex with a bar of dark grey suffusion, above apex with three dark fuscous strigulæ, before first of these bronzy. Hindwings rather dark grey; cilia grey.

Khasi Hills, in November; Pusa, Bengal, bred in April from larvæ mining leaves of *Blumea lacera* (Lefroy), four specimens.

Acrocercops isodelta, n. sp.

♀. 8 mm. Head white, face fuscous-tinged. Palpi white, second joint with upper edge and an apical band blackish, terminal joint with blackish submedian ring. Antennæ grey, in front whitish, basal joint white, beneath blackish. Thorax white, sides bronzy-fuscous. Abdomen grey, beneath white. Legs white, banded with dark fuscous and blackish. Forewings narrowly elongate-lanceolate, bronzy-fuscous, a moderately broad ochreous white dorsal streak from base, between ¼ and ¾ forming three broad triangular black edged blotches whose tips almost or quite coalesce with white black edged dots on costa, the angular indentations between these almost reaching dorsum a fine white black-edged oblique transverse streak before apex: cilia whitish, beneath tornus greyish, beneath apex with a bronzy bar, above apex with three dark fuscous strigulæ before first of these bronzy. Hindwings rather dark grey, cilia grey.

Maskeliya, Ceylon, in January (Pole) one specimen.

Acrocercops lyrica n. sp.

♂. 8 mm. Head shining white. Palpi white, second joint with two dark grey bands, apex of terminal joint dark grey. Antennæ grey. Thorax white, sides bronzy-fuscous. Abdomen grey, anal tuft white, beneath white with lateral series of oblique grey stripes. Legs white, banded with dark grey. Forewings very narrowly lanceolate, gradually narrowed from near base, bronzy fuscous, becoming bronzy-ochreous on dorsal half, a silvery-white streak along dorsum from base to tornus, its apex rather dilated into an irregular spot, a silvery white elongate patch along termen from above tornus almost to apex, its anterior extremity emitting a projection which extends ⅓ across wing; above this patch beneath costa is a sinuate black longitudinal line terminating in a transverse black apical mark: cilia white, towards tornus greyish, above apex with a black median line, beneath apex with a blackish bar. Hindwings rather dark grey; cilia grey.

Maskeliya, Ceylon, in March (Pole); one specimen.

Acrocercops gemoniella, Stt.

(*Gracilaria gemoniella*, Stt., Trans. Ent. Soc. Lond. i (3rd sers.), 297, pl. x, 6.)

Maskeliya, Ceylon, in March and April (Pole); N. Coorg. 3,500 feet, in October (Newcome). None of my specimens show the anterior prominence of the dorsal streak mentioned by Stainton, but otherwise they agree precisely, and I am unable to regard them as distinct

Acrocercops argyraspis, n. sp.

♂. 8 mm. Head white. Palpi white, lined with blackish. Antennæ whitish-grey. Thorax shining white, sides ochreous-bronze. (Abdomen broken.)

Legs white, banded with dark fuscous. Forewings very narrowly elongate-lanceolate; ochreous-bronze ; a moderate silvery-white stripe along dorsum from base to tornus, a bright silvery-white apical blotch occupying more than ¼ of wing, narrowed towards costa, anterior edge rounded and edged with dark fuscous suffusion, enclosing a subtransverse black apical mark : cilia white, at apex with a blackish median line, towards tornus grey. Hindwings dark grey : cilia grey.

Khasi Hills, in March : two specimens.

Acrocercops galeopa, n. sp.

♀. 10—11 mm. Head ochreous-whitish. Palpi whitish, apex of second joint sometimes with a grey dot. Antennæ whitish, faintly dotted with grey. Thorax whitish, sides pale ochreous. Abdomen pale greyish-ochreous, beneath ochreous-whitish, Legs whitish, indistinctly banded with grey. Forewings very narrowly elongate, moderately pointed, apex slenderly produced, acute : ochreous-whitish, towards base more ochreous-tinged: a moderate undefined pale ochreous spot on costa before middle, and another on dorsum beyond middle, almost connected into an obliquo fascia ; apical third of wing almost wholly occupied by an ochreous-brown patch composed of several confluent spots, sometimes with an undefined transverse bar of dark fuscous irroration at ¾ : cilia whitish-ochreous. Hindwings grey; cilia pale greyish-ochreous.

Khasi Hills, from July to September : three specimens.

Acrocercops ochronephela, n. sp.

♂. 9—10 mm. Head shining whitish-ochreous, face more whitish. Palpi whitish. Antennæ whitish, spotted with grey. Thorax ochreous. Abdomen grey, beneath whitish. Legs white, banded with dark fuscous. Forewings very narrowly elongate-lanceolate ; yellow-ochreous, deeper and sometimes brownish-tinged posteriorly ; two slender cloudy undefined whitish-ochreous transverse fasciæ at about ⅗ and ⅘ : cilia pale ochreous, above apex ochreous-whitish Hindwings rather dark grey ; cilia grey.

Khasi Hills, in December and March ; three specimens.

Acrocercops sauropis, n. sp.

♂. 9 mm. Head ochreous-whitish. Palpi white, terminal joint sometimes spotted with grey. Antennæ greyish. Thorax light greyish-bronze. Abdomen greyish, beneath white with lateral series of oblique fuscous stripes. Legs white, spotted with grey and blackish. Forewings very narrowly elongate, gradually narrowed, apex rounded-pointed ; light red-brownish, somewhat mixed with shining grey, a fine oblique white stria from ¾ of costa to tornus, edged posteriorly in middle by several black scales ; a white dot on costa near apex, partially blackish edged; a small round black apical spot : cilia grey, round apex brownish, beneath apex with a blackish hook, above apex with a white spot. Hindwings dark grey; cilia grey.

Khasi Hills, in October ; two specimens.

Acrocercops telearcha, n. sp.

♂ ♀. 11-14 mm. Head shining ochreous-white. Palpi white, second joint with blackish-grey apical band, terminal joint with anterior edge blackish towards apex. Antennæ dark grey. Thorax ochreous-white, sides dark bronzy-fuscous. Abdomen rather dark grey, beneath obliquely banded with white. Legs dark grey, ringed with white. Forewings very narrowly elongate, short-pointed, apex obtuse ; dark bronzy-fuscous ; a yellow-whitish streak along dorsum from base to tornus, upper edge twice sinuate upwards, and enlarged into a round spot at apex ; an elongate-oval whitish spot beneath costa at ⅖ ; from six to eight fine oblique white strigulæ from posterior half of costa, variable in number and length, last transverse and cutting off a small black apical spot ; two white dots on termen, lower larger : cilia grey, round apex dark fuscous, white at base above apex and on a bar beneath apex. Hindwings rather dark grey; cilia grey.

Maskeliya, Ceylon, in January, June, and October (Pole) ; three specimens.

Acrocercops mantica, n. sp.

♂. 10 mm. Head yellow-whitish, sides of crown yellowish, face white with a blackish median bar. Palpi white, second joint dark grey except towards base, with tuft of projecting scales beneath. Antennæ white, pale greyish above. Thorax white, with yellow-ochreous spot on shoulders and small black posterior spot. (Abdomen broken.) Legs white, banded with ochreous-yellowish and ringed with dark grey. Forewings very narrowly elongate-lanceolate, acute ; bright deep ochreous-yellow; costal edge blackish; base of dorsum white : three white discal blotches, first moderate, subtriangular, blackish-edged, before ¼, second elongate, extending from ¼ to ⅗, sometimes connected with first, third very elongate, extending from just beyond second to costa near apex ; a slender inwardly oblique blackish streak from middle of costa to junction of first two blotches, preceded by a white costal dot ; a fine white very oblique strigula from ⅗ of costa running into third blotch near apex, space between this and third blotch black, extended as a blackish streak between second and third blotches ; a short white strigula along costa running into apex of third blotch, space between this and preceding strigula black ; a white apical mark : cilia whitish-ochreous, towards tornus greyish, basal third yellow-ochreous, at apex with two blackish hooks. Hindwings and cilia grey.

Khasi Hills, in November ; two specimens.

Acrocercops cornicina, n. sp.

♀. 9 mm. Head shining whitish-ochreous, face beneath a dark grey bar whitish. Palpi white, second joint blackish towards apex, beneath with a short tuft of projecting scales. Antennæ greyish, beneath white. Thorax pale ochreous. Abdomen dark grey, beneath whitish becoming ochreous-tinged posteriorly, with laterial series of oblique dark grey stripes meeting beneath. Legs yellow-whitish, ringed with blackish. Forewings very narrowly elongate, parallel-sided, moderately pointed ; bronzy-ochreous ; marking silvery white, strongly edged with black ; a rather broad fascia, followed by a second more oblique fascia united with it dorsally ; a moderate inwardly oblique fascia from middle of costa, not reaching dorsum, posteriorly produced along costa as a short fine twice interrupted line ; a rather broad very oblique fascia from dorsum before tornus to about ⅘ of costa, bifurcate on costal half, furcation filled with black; white apical and præapical costal dots: cilia whitish, basal third yellow-ochreous, above apex ochreous-whitish, with a black apical hook, towards tornus greyish. Hindwings and cilia grey.

Khasi Hills, in March; one specimen.

Acrocercops macroplaca, n. sp.

♂. 11 mm. Head metallic-shining whitish-ochreous, face more whitish, lower part mixed with grey. Palpi white, second joint black except towards base, beneath with tuft of long projecting mixed black and whitish scales. Antennæ whitish, dotted with grey. Thorax ochreous-whitish, mixed with dark fuscous. (Abdomen broken.) Legs whitish, banded with yellowish and ringed with blackish. Forewings very narrowly elongate, gradually pointed, acute; brownish, towards costa anteriorly suffused with rather dark fuscous, elsewhere towards costa yellowish-tinged; costal edge dark fuscous; an irregular narrow ochreous-white blackish-edged inwardly oblique fascia at ¼, narrowest towards costa; an elongate white black-edged spot along costa before middle, and a smaller similar one beyond middle; an elongate ochreous-whitish black-edged spot on fold at ⅔; an irregular elongate ochreous-whitish, black-edged mark in middle of disc, connected with anterior extremity of first costal spot; a rather thick whitish-ochreous black-edged streak rising from dorsum before tornus, then bent and continued to apex, becoming white posteriorly; a fine whitish line running from second costal spot beneath costa into this streak near apex: cilia greyish, round apex ochreous-whitish, towards base ochreous-yellowish, beneath apex with two blackish hooks. Hindwings and cilia grey.

Khasi Hills, in November; one specimen.

Acrocercops melanoplecta, n. sp.

♂ ♀. 9—10 mm. Head yellow-whitish. Palpi white, second joint with upper edge blackish, and beneath with rather long projecting scales towards apex mixed with blackish. Antennæ whitish spotted with grey. Thorax pale whitish-yellowish. Abdomen whitish-ochreous tinged with grey, beneath white with lateral series of oblique grey lines. Legs white, banded with pale ochreous and indistinctly ringed with blackish, apex of anterior and middle tibiæ banded with black. Forewings very narrowly elongate-lanceolate, apex long-pointed, acute; yellowish-white, with scattered yellow-ochreous scales and transverse strigulæ; an elongate black spot along costa about ¼; a very oblique triangular yellow-ochreous spot from costa about ⅔, sometimes marked with a black dot; an elongate yellow-ochreous spot along apical portion of costa, marked anteriorly with a black dot: cilia yellow-whitish, at apex with two or three dark grey hooks. Hindwings and cilia grey or pale grey.

Khasi Hills, in October and March; seven specimens.

Acrocercops plocamis, n. sp.

♂. 10 mm. Head ochreous-whitish, face white. Palpi dark fuscous second joint white at base and apex, with tuft of projecting scales beneath, terminal joint white with two dark fuscous bands. Antennæ dark fuscous, slenderly ringed with whitish. Thorax bronzy-ochreous, sprinkled with dark fuscous. (Abdomen broken.) Legs blackish, banded with white. Forewings very narrowly elongate, moderately pointed, acute, whitish-ochreous mostly suffused with ochreous-brownish ; an undefined streak of black suffusion along costa ; four narrow white transverse streaks edged with dark fuscous, first and second at $\frac{1}{6}$ and $\frac{1}{3}$, slightly curved, direct, third median, obliquely curved, fourth at $\frac{4}{5}$, similar ; beyond third is an outwardly oblique white dark-edged strigula from costa, and an oblique white mark below middle ; on anterior half of wing are two or three dark fuscous striæ parallel with and intermediate between the white streaks ; a curved transverse silvery metallic dark-edged line before appex : cilia whitish, with blackish subbasal and median lines round apex, beneath tornus greyish. Hindwings dark grey : cilia grey.

Maskeliya, Ceylon, in April (Pole) ; one specimen.

Acrocercops convoluta, n. sp.

♂ ♀. 9—10 mm. Head whitish-ochreous mixed with grey, face white. Palpi ochreous-fuscous, second joint white at apex, with tuft of loose projecting scales beneath, terminal joint white with two dark fuscous rings. Antennæ ochreous-whitish suffusedly ringed with dark fuscous. Thorax ochreous-whitish irrorated with ochreous and dark fuscous. Abdomen grey, beneath white, with lateral series of oblique dark fuscous streaks. Legs dark ochreous-fuscous ringed with white, bristles of posterior tibiæ very short. Forewings very narrowly elongate, parallel-sided, short-pointed, apex obtuse ; whitish-ochreous, with numerous strong dark fuscous transverse striæ, angulated above middle, at first slightly, more acutely posteriorly ; the coalescence of these tends to form a dark fuscous fascia before middle, and two pairs of oblique dark fuscous costal and dorsal spots posteriorly ; alternating with these are oblique white costal and dorsal strigulæ, variable and irregular, sometimes meeting, last dorsal long and curved ; a curved oblique silvery transverse stria towards apex, beyond which is a white dot on costa ; apex longitudinally brownish-ochreous, suffused with dark fuscous anteriorly ; cilia grey, round apex grey-whitish with a black subbasal line and dark grey median line. Hindwings dark grey ; cilia grey.

Maskeliya, Ceylon, in January, February, May, September, and October (Pole) ; eight specimens.

Acrocercops strophala, n. sp.

♀. 10—11 mm. Head whitish, crown mixed with light grey. Palpi fuscous mixed with blackish, second joint with tuft of loose projecting scales beneath, terminal joint white, anterior edge black except towards base. Antennæ dark grey. Thorax whitish mixed with dark fuscous. Abdomen grey-whitish, beneath white with lateral series of oblique dark fuscous streaks. Legs dark grey ringed with whitish. Forewings very narrowly elongate, parallel sided, short-pointed, apex obtuse ; dark fuscous sprinkled with whitish, with four pairs or triplets of white transverse lines separated by black lines, first to somewhat sinuate-angulated, third more angulated, fourth anteapical, evenly curved; apical spot dark fuscous, costal and terminal edges finely white: cilia light fuscous, round apex whitish-suffused with dark fuscous subbasal shade and median line, beneath apex with black basal line. Hindwings grey; cilia light fuscous.

Maskeliya, Ceylon, in February (Pole): Khasi Hills, in October; three specimens. Much like *convoluta*, but distinguished by different marking of terminal joint of palpi, and evenly curved anteapical white (not silvery) double lines.

Acrocercops patricia, n. sp.

♂ ♀. 13 mm. Head ochreous-whitish. Palpi bronzy mixed with dark fuscous, second joint with apex white, beneath with tuft of long projecting scales, terminal joint white with two oblique dark fuscous rings. Antennæ whitish suffusedly spotted with grey. Thorax whitish mixed with grey and dark fuscous. Abdomen grey, beneath white with lateral series of oblique dark fuscous stripes. Legs blackish, ringed with white. Forewings very narrowly elongate, parallel-sided, short-pointed, apex obtuse; ochreous-bronze, mixed with dark grey, especially towards margins; dorsal half suffused with whitish from base to ⅓; some undefined whitish striæ from costa about ⅔: three oblique black spots on posterior half of costa, separated by two angulated transverse fasciæ of three white striæ each, separated by dark fuscous lines, some of which are black on costa; beyond last black spot an angulated pair of white transverse striæ separated by a violet blackish line; apical area dark bronzy, with a small conspicuous white triangular spot on costa before apex: cilia grey, mixed with whitish, round apex with blackish subbasal shade and median line. Hindwings blackish grey; cilia grey.

Khasi Hills, in October; two specimens. Separable from the two preceding by the white costal anteapical spot.

Acrocercops orientalis, Stt.

Coriscium orientale, Stt., Trans. Ent. Soc. Lond. iii (n. ser.) 301.

Khasi Hills, in March. Recognisable by the two violet posterior striæ.

Acrocercops ustulatella, Stt.

(*Gracilaria ustulatella*, Stt., Trans. Ent. Soc. Lond., v. (n. ser.), 121; *Conopomorpha isochorda*, Meyr., Journ. Bomb. N. H. Soc., XVII, 746.)

I have identified this from the type.

Cyphosticha acrolitha, n. sp.

♀. 9 mm. Head, thorax, and abdomen white. Palpi white, with subapical ring on second joint, and two rings on terminal joint of dark fuscous irroration. Antennæ white, faintly ringed with pale fuscous. Legs white, banded with pale ochreous, first joint of anterior and middle tarsi with black apical band, middle tibiæ dilated with long spatulate scales. Forewings very narrowly elongate-lanceolate; white; five moderate slightly oblique pale ochreous-yellowish fasciæ, sometimes fuscous-sprinkled, first basal, indistinct, third before middle, broadest; between the fasciæ are two or three yellowish strigulæ; a black transverse spot in disc at ⅔, and another from costa close beyond it; some fine blackish irroration beyond these : cilia pale ochreous, towards tornus greyish-tinged, outer half paler and sprinkled with fuscous irroration. Hindwings rather dark grey ; cilia pale grey.

Maskeliya, Ceylon, in March, June, and September (Pole) ; three specimens.

Macarostola leucochorda , n. sp.

♀. 9 mm. Head white. Palpi white, second joint smooth-scaled, with upper edge dark grey, terminal joint longer than second, with anterior edge blackish. Antennæ dark fuscous, beneath white. Thorax dark bronzy grey, posterior extremity white. Abdomen grey, beneath ochreous-whitish. Legs white, banded with grey and blackish. Forewings very narrowly elongate parallel-sided, moderately pointed ; dark bronzy-grey ; an evenly broad snow-white streak along dorsum from base almost to apex, its upper edge narrowly incised about middle of termen, its extremity dilated into a triangular projection, edged above by a short black anteriorly white margined costal mark close before apex of wing ; three fine longitudinal white lines from about ⅗ to opposite incision of dorsal streak, uppermost costal, second curved up to costa anteriorly, lowest obsolescent anteriorly : cilia grey, white at base round apex and on a small spot below apex, at apex with a blackish hook. Hindwings rather dark grey ; cilia grey.

N. Coorg, 3,500 feet, in June (Newcome) ; one specimen.

Macarostola capnias, n. sp.

♂ ♀. 6 mm. Head and thorax shining grey. Palpi whitish, second joint with black apical band, terminal joint shorter than second, blackish with white supramedian band. Antennæ dark grey. Abdomen rather dark grey, beneath whitish. Legs whitish, lined and banded with blackish. Forewings narrowly elongate-lanceolate, acute ; rather dark ashy-grey, with a slight purplish tinge ; apical area suffused with ochreous ; a fine oblique transverse whitish line at ⅔ ; two pairs of whitish strigulæ on costa towards apex, last margining a small round black apical spot : cilia grey, beneath apex with a patch of ochreous suffusion, round apex with two blackish lines. Hindwings rather dark grey ; cilia grey.

Maskeliya, Ceylon, in March (Pole) ; two specimens.

Macarostola perisphena, Meyr.

(*Gracilaria perisphena*, Meyr., Journ. Bomb. N. H. Soc., XVI, 613.)

I have this also from Diyatalawa, Ceylon, and the Nilgiri Hills, in May and August.

Macarostola paradisia, n. sp.

♂. 11 mm. Head ochreous-whitish, back of crown and sides of face crimson-pink. Palpi smooth-scaled, crimson-pink, terminal joint longer than second, whitish. Antennæ whitish-ochreous. Thorax whitish, anteriorly crimson-pink. Abdomen light grey, beneath white with lateral series of oblique grey lines edged posteriorly with ochreous-yellowish. Legs white, partially suffused with yellowish, and ringed with blackish-grey. Forewings very narrowly elongate, parallel-sided, short pointed, apex obtuse ; light crimson;

base narrowly pale yellowish ; a moderate subquadrate yellow spot on dorsum towards base ; two elongate yellow spots on dorsum before and beyond middle of wing, touching above so as to enclose a small crimson spot on dorsum ; a pale yellowish streak from costa at ¼, at first transverse, angulated in disc and continued longitudinally to ⅓ ; an oblique pale yellowish streak from costa before middle, reaching nearly half across wing ; a longitudinal pale yellowish mark in disc at ⅔; an elongate yellow spot along termen beyond tornus ; a transverse black mark near apex, edged anteriorly towards costa with yellow suffusion : cilia grey, round apex yellowish, base on upper part of termen crimson. Hindwings rather dark grey ; cilia grey.

Maskeliya, Ceylon, in October (Pole) ; one specimen.

Macarostola hieranthes, Meyr.

(*Coriscium hieranthes*, Meyr., Journ. Bomb. N. H. Soc., XVII, 745.)

In this species the second joint of palpi is shortly tufted beneath, as is implied by the reference to the genus *coriscium*, which I have now suppressed.

Macarostola thriambica, Meyr.

(*Gracilaria thriambica*, Meyr., Journ. Bomb. N. H. Soc., XVII, 745.)

Second joint of palpi smooth-scaled.

Macarostola coccinea, Wals.

(*Gracilaria coccinea*, Wals., Swinh. Cat. Het., ii, 576.)

I do not possess this, but it is probably referable here.

Macarostola callischema, n. sp.

♂. 9 mm. Head yellow-whitish, sides of face crimson. Palpi smooth-scaled, crimson, terminal joint longer than second, whitish. Antennæ ochreous-whitish. Thorax crimson, posteriorly pale yellowish. Abdomen pale grey, towards apex yellow-whitish, beneath white, with lateral series of oblique grey lines edged posteriorly with whitish-yellowish. Legs whitish ringed with blackish grey, anterior femora crimson-tinged. Forewings very narrowly elongate, parallel sided, short-pointed ; crimson-red ; markings pale whitish-yellowish, becoming yellow towards dorsum ; three rather oblique rounded-triangular dorsal spots reaching more than half across wing, apex of third produced posteriorly as a longitudinal streak in disc ; between first and second is a subdorsal dot ; an elongate anteriorly dilated spot beneath costa before middle and a sinuate streak beneath central portion of costa, anteriorly resting on costa and almost meeting preceding spot ; minute costal dots at ⅓, ⅔, and beyond ¾ ; a narrow oblique anteapical fascia, rather dilated towards termen : cilia grey, round apex yellowish with base crimson. Hindwings rather dark grey ; cilia grey.

Khasi Hills, in September ; one specimen.

Macarostola tegulata, n. sp.

♂. 10 mm. Head whitish, sides of face crimson-pink, crown partially yellow-suffused, collar crimson-pink. Palpi smooth-scaled, crimson-pink, terminal joint and apex of second white, terminal longer than second. Antennæ ochreous-whitish. Thorax crimson, posteriorly yellow with a crimson spot, Abdomen dark grey, beneath whitish with lateral series of oblique dark grey lines. Legs white, tarsi spotted with blackish, anterior and middle femora crimson, anterior and middle tibiæ banded with crimson. Forewings very narrowly elongate, parallel-sided, rather short-pointed, apex round-pointed; crimson, small yellow spots on costa and dorsum near base, and two others longitudinally placed beneath costa; three broad-triangular yellow dorsal spots, hardly reaching half across wing; strong oblique yellow streaks from costa at ¼ and ½, second reaching more than half across wing, between these a small yellow subcostal spot; beyond the second are five similar approximated yellow or yellow-whitish streaks diminishing in length posteriorly, last extremely short, separated by a few black scales; apical area suffused with brownish-ochreous, on termen greyish-tinged; a minute black apical dot: cilia crimson, towards tornus grey, round apex marked with yellowish, and with a black median spot opposite apex. Hindwings rather dark grey: cilia grey.

Khasi Hills, in July; one specimen.

Gracilaria octopunctata, Turn.

(*Gracilaria octopunctata*, Turn., Trans. Roy. Soc. S. Austr. 1894, 123.)

Pusa, Bengal (Lefroy); Khasi Hills; N. Coorg, 3,500 feet (Newcome), in August and September. Also occurs in Australia.

Gracilaria parasticta, n. sp.

♀. 15 mm. Head ochreous-whitish, face pale-ochreous mixed with brownish. Palpi pale ochreous mostly suffused with fuscous. Antennæ greyish-ochreous suffusedly ringed with dark fuscous. Thorax brown, with a broad whitish dorsal stripe. (Abdomen broken.) Anterior and middle femora and tibiæ suffused with dark fuscous, tarsi whitish, posterior legs pale ochreous sprinkled with dark fuscous. Forewings very narrowly elongate, rather long-pointed, acute; rather deep ochreous-brown, with some fine scattered dark fuscous scales; a narrow ill-defined pale ochreous streak along dorsum from base to tornus; plical and first discal stigmata large, dark fuscous, plical rather obliquely before first discal: cilia brown, on upper portion of termen with outer half paler and irrorated with blackish, towards tornus grey. Hindwings rather dark grey, cilia grey.

Khasi Hills, in February; one specimen.

Gracilaria argalea, n. sp.

♂. 9—10 mm. Head and thorax grey, face paler or whitish. Palpi whitish, second joint sprinkled with blackish-grey towards apex, terminal joint with base and a subapical band blackish. Antennæ grey, obscurely pale-ringed. Abdomen grey, beneath whitish. Anterior and middle femora and tibiæ blackish, tarsi white, posterior tibiæ greyish, tarsi white ringed with black. Forewings very narrowly elongate, moderately pointed, apex round pointed; dark purple-fuscous irregularly irrorated throughout with whitish, most distinctly spotted on middle of costa: cilia grey, round apex with several dark-fuscous lines. Hindwings rather dark grey; cilia grey.

Maskeliya, Ceylon, in January (Pole); Khasi Hills, in August; two specimens.

Gracilaria syrphetias, Meyr.

(*Gracilaria syrphetias*, Meyr. Journ. Bombay N. H. Soc. XVII, 984.)

Also from Dodanduwa and Nuwara Eliya, Ceylon, in April and September (Fletcher); some specimens reaching 17 mm. in expanse.

Gracilaria prismatica, Meyr.

(*Gracilaria prismatica*, Meyr., Journ. Bombay N. H. Soc. XVII, 983.)

Also taken in January.

Gracilaria chalcanthes, Meyr.

(*Gracilaria chalcanthes*, Meyr., Trans. Ent. Soc., Lond., 1894, 25.)

Hiterto only from Burma.

Gracilaria isochrysa, n. sp.

♀. 14 mm. Head shining coppery-bronze, face silvery-white. Palpi whitish, second joint with a few blackish scales, apex of terminal joint blackish. Antennæ whitish, ringed with grey. Thorax shining coppery-bronze. Abdomen dark grey, beneath yellow-whitish. Legs whitish (anterior pair broken), middle femora and tibiæ reddish-coppery, redder beneath, posterior tibiæ infuscated above. Forewings very narrowly elongate, gradually narrowed posteriorly, pointed, apex acute; coppery-reddish, with dark fuscous strigulæ suffused with deep shining blue; a broad bright brassy-yellow costal streak from near base to apex, covering rather more than half the wing: cilia grey, beneath apex reddish towards base, on costa pale yellow. Hindwings and cilia rather dark grey.

Khasi Hills, in June; one specimen.

Gracilaria zachrysa, Meyr.

(*Gracilaria zachrysa*, Meyr., Journ. Bombay N. H. Soc. XVII. 983.)

Also in November.

Gracilaria euryptera, n. sp.

♀. 15 mm. Head violet-fuscous, face and forehead pale yellowish. Palpi moderate, light yellowish. Antennæ dark grey, ringed with whitish. Thorax dark violet-fuscous. Abdomen dark grey, beneath light yellow. Legs pale yellowish, anterior and middle femora and tibiæ and apical half of posterior femora dark violet-fuscous, posterior tibiæ suffused with violet fuscous. Forewings elongate, narrow, moderately pointed; deep fuscous-purple; a broad triangular yellow patch extending over central third of costa, its apex reaching dorsum: cilia fuscous, round apex irrorated with blackish towards tips. Hindwings dark grey; cilia grey.

Pattipola, Ceylon, in May (Alston); one specimen. Broader-winged than any species of the genus known to me; the wings are relatively twice as broad as in *G. theivora*, its nearest ally.

Gracilaria theivora, Wals.

(*Gracilaria theivora*, Wals., Ind. Mus. Not. ii, 49.)

Maskeliya and Madulsima, Ceylon, from April to January, common (Pole, Green).

Gracilaria megalotis, n. sp.

♂ ♀. 10—12 mm. Head pale ochreous or greyish-ochreous, sometimes brownish-tinged on crown, scales of forehead somewhat overhanging. Palpi ochreous irrorated with dark-fuscous. Antennæ dark grey, obscurely pale-ringed, basal joint clothed in front with large projecting tuft of ochreous and dark fuscous scales. Thorax brownish-ochreous tinged with violet. Abdomen dark fuscous, beneath yellow. Anterior and middle femora and tibiæ violet-ochreous irrorated with blackish, tarsi white banded with yellow-ochreous, posterior legs ochreous, tibiæ tinged with violet-fuscous. Forewings very narrowly elongate, moderately pointed ; apex round-pointed ; shining violet-ochreous, more or less strigulated finely with fuscous ; a triangular costal patch more or less suffused with pale yellowish towards costa, its sides indicated by series of small black raised scale tufts, anterior only partially extending on costa from $\frac{2}{7}$ to $\frac{4}{7}$, and reaching dorsum, where its apex forms a small scale-projection ; two or three other small scattered black scale tufts, and two or three scattered black scales on dorsal margin in cilia ; posterior area of costa more or less widely suffused with pale yellowish ; a transverse bar of deep purple suffusion before apex : cilia pale ochreous irrorated with dark fuscous, sometimes suffused with bright fulvous towards base, towards tornus grey. Hindwings and cilia dark grey.

Khasi Hills, in March ; four specimens. Specially characterised by the large basal tuft of antennæ.

Gracilaria acrotherma, n. sp.

♂ ♀. 8—12 mm. Head brownish, face whitish-ochreous. Palpi ochreous-whitish, tip sometimes dark fuscous. Antennæ grey. Thorax brownish. Abdomen dark grey, beneath whitish-ochreous. Anterior and middle femora and tibiæ dark purple-fuscous mixed with blackish, tarsi whitish, posterior legs whitish-ochreous. Forewings very narrowly elongate, moderately pointed, acute ; ochreous-brownish tinged with violet, paler and more yellowish-tinged towards costa posteriorly ; about eight minute black dots on costa from about $\frac{1}{3}$ to $\frac{2}{3}$; a few black specks in middle of disc ; an undefined patch of dark fuscous irroration towards apex, sometimes extended as a cloudy streak to middle of disc : cilia grey, round apex with several blackish lines. Hindwings dark grey ; cilia grey.

Colombo, four specimens bred in October, from larvæ mining leaves of *Cajanus indicus* (Green) ; Hakgala, Ceylon, two specimens bred in March and April from larvæ on *Atylosia Candollei*, drawing together terminal leaves to form a chamber (Green). The two food-plants are closely related, *Leguminosæ* ; the apparent difference in habits is curious, but the two sets of specimens seem exactly alike in characters, except that the *Atylosia*-feeders are larger.

Gracilaria dogmatica, n. sp.

♂ ♀. 7—9 mm. Head and thorax light ochreous-brown, with two broad metallic-grey longitudinal streaks, scales of crown projecting between antennæ, face white. Palpi white, terminal joint thickened with scales towards apex.

Antennæ grey obscurely ringed with whitish. Abdomen grey, with a dark shining grey lateral stripe, beneath pale yellow. Legs densely scaled, ochreous-white, anterior and middle femora and tibiæ blackish, posterior tibiæ more or less infuscated above. Forewings very narrowly elongate, moderately pointed, acute; light ochreous-brown, suffused with yellow-ochreous on margins posteriorly; three small groups of blackish scales on dorsum; a broad whitish-yellowish triangular patch extending over central third of costa, and reaching ¾ across wing, edged with a few blackish scales; some undefined dark-fuscous suffusion towards apex: cilia grey, round apex with basal third yellow-ochreous, rest with several rows of black points. Hindwings dark grey; cilia grey.

Trincomali, Puttalam, Ambulangoda, Galle, Hambantota, Peradeniya, and Diyatalawa. Ceylon, from September to November, February to April, and in June (Pole, Fletcher, Green); eight specimens.

Gracilaria oxydelta, n. sp.

♀. 8 mm. Head, thorax, and abdomen rather dark violet-fuscous, face pale yellowish. Palpi ochreous-whitish, irregularly irrorated with blackish, terminal joint thickened with scales shortly projecting beneath towards apex. Antennæ dark fuscous ringed with whitish. Anterior and middle legs dark violet-fuscous, tarsi white except at tips, posterior legs ochreous-whitish irrorated with dark fuscous. Forewings very narrowly elongate, short-pointed, dorsum with four rather broad scale-projections; violet-fuscous irrorated with dark fuscous; a clear pale yellow narrow or moderately broad triangular patch, resting on costa before middle, nearly reaching dorsum, edged with a few black scales, its costal margin marked with two minute black dots; some undefined spots of ochreous-brownish suffusion towards apex: cilia fuscous, round apex brownish with several rows of black points. Hindwings rather dark grey: cilia grey.

N. Coorg, 3,500 feet, in May (Newcome), two specimens.

Gracilaria hemiconis, Meyr.

(*Antiolopha hemiconis*, Meyr., Trans. Ent. Soc. Lond., (1894, 25.)

I have suppressed the genus *Antiolopha*, finding the scaling of the palpi an unreliable character in this group.

Gracilaria metadoxa, n. sp.

♂ ♀. 10-11 mm. Head yellowish-white, scales of crown projecting over forehead. Palpi yellow-whitish, more or less sprinkled with grey, second joint with scales projecting beneath at apex, terminal joint thickened with scales forming a small subapical projection in front. Antennæ yellow-whitish ringed with grey. Thorax ochreous-whitish, shoulders brownish-tinged. Abdomen whitish-ochreous, more or less suffused with grey above. Legs ochreous-whitish, anterior and middle femora and tibiæ infuscated and spotted with dark grey, posterior pair more or less irrorated with fuscous. Forewings very narrowly elongate, rather short-pointed, apex obtuse; dorsum with three strong raised scale-projections; light violet-brown, sometimes partially irrorated with darker brown; dorsal scale-projections mixed with blackish; base of dorsum narrowly pale yellowish ; a slender oblique pale yellowish streak from costa at ⅕, nearly reaching dorsum, edged anteriorly with yellow-brown suffusion ; a triangular patch extending over central fifth of costa outlined first with a pale yellowish streak partially edged externally on posterior margin with blackish and then with yellow-brown suffusion, reaching ¾ across wing ; a pale yellowish dot in disc at ⅔ ; a pale yellowish streak from ⅘ of costa to tornus, sometimes interrupted into three small spots ; a small blackish dot towards apex, above and below which are pale yellowish dots on margin : cilia whitish-ochreous, with two or three rows of blackish-grey points, beneath tornus grey. Hindwings and cilia grey.

Khasi Hills, in October and November ; ten specimens.

Gracilaria auricilla, Stt.

(*Gracilaria auricilla*, Stt., Trans. Ent. Soc. Lond., v. (n. ser.), 120.)

I have not obtained this species.

APPENDIX.

The species described (very inadequately) by Nietner under the name of *Gracilaria coffeifoliella* does not seem to belong to the *Gracilaria* group at all, but I have not succeeded in identifying it. The larva is said to be common as a leaf-miner on coffee ; perhaps some collector could search specially for it.

THE ORCHIDS OF THE BOMBAY PRESIDENCY.

BY

G. A. GAMMIE, F.L.S.

PART VII. (WITH PLATE VII.)

(*Continued fram page 590 of this Volume.*)

18. RHYNCHOSTYLIS.

Epiphyte. *Stems* elongate, clothed with the sheaths of fallen leaves below, leafy upwards. *Leaves* two-ranked, thick, strap-shaped, curved, lobed or gashed at apex. *Flowers* showy, in long, dense, pendulous, cylindric racemes; *sepals* and *petals* broad, spreading, contracted at base, *lip* advate to the base of the column, saccate, mouth of spur pubescent, *lateral lobes* absent, *limb* obovate: *column* short, stout; *pollinia* 2, sub-globose, *strap* clavate, *gland* small, oblong.

1. RHYNCHOSTYLIS RETUSA, *Blume. Bijdr. p. 286, t. 49; Fl. Br. Ind. VI, p. 32; Cooke, Fl. of Bombay, II, p. 698*: Saccolabium guttatum, *Lindl. Dalz. and Gibs., p. 263.*

Strongly attached to the stems and branches of trees by long, thick roots. *Stems* obliquely projecting from their supports, 3 to 8 or more inches long, according to their age, as thick as the finger, covered below with the short brown sheaths of fallen leaves. *Leaves* two-ranked, with stem clasping bases, from 6 to 18 inches long and about one inch broad, curved, deeply channelled, unequal bi-lobed or gashed at apex. *Racemes* usually longer than the leaves; *flowers* ½ to ¾ inch in diameter, pale-pink with darker spots, *lip* purple, *spur* flattened, thimble-shaped.

In the common variety the *flowers* are ½ inch in diameter, the *sepals* and *petals* with few purple spots on the upper half, the *dorsal* sepal is elliptic acute, the *lateral* broader, obliquely obovate sub-obtuse, the *petals* are a little narrow than but otherwise similar to the dorsal sepal, the *lip* is purple, reflexed and emarginate at apex with rounded lobes.

In *variety 2*, the *leaves* are deeply channelled as in the above, the size and shape of the parts of the flowers are similar, but the *lip* is white with purple blotches and spots.

In *variety 3*, the leaves are not so deeply channelled; the *flowers* are ¾ inch in diameter; the *sepals* and *petals* are profusely spotted and streaked with purple; the *lip* is uniformly rose purple, straight, emarginate at apex with acute lobes.

Flowers appear in May and June and sometimes continue into July.

Distribution. This plant is common throughout the region of heavy rainfall from the Thana District to North Kanara, ranging southwards to Ceylon. It extends from the base of the Western Himalayas in Garhwal through Assam and the Khasia Hills to Burma and the Malayan Archipelago.

Details of Plate VII.—Rhynchostylis retusa, *Blume.*

Plant. ⅔rds natural size.

a. flower seen from the front.

b. flowers, divested of sepals and petals, showing the column, lip and spur.

(To be continued.)

PLANTS OF THE PUNJAB.

A BRIEF DESCRIPTIVE KEY TO THE FLORA OF THE PUNJAB, NORTH-WEST FRONTIER PROVINCE AND KASHMIR.

BY

Lieut.-Colonel C. J. Bamber,

Indian Medical Service.

PREFACE.

This key is intended chiefly for the use of inquirers who have very little knowledge of botany.

The plan, that has been followed, is to classify all plants according to such characteristics as are obvious to all. Amateur botanists often complain of the difficulty they find in tracing out any plant in an ordinary Flora ; it is with the hope of helping such persons that this book has been compiled. It has been the intention of the author to use as few technical terms as possible.

The area, dealt with, is bounded on the north and north-east by the snow line of the Himalaya, on the east and south-east by the Jumna, on the south by Central India and Scinde, and the west and north-west by Afghanistan and Baluchistan. The North-West Frontier Province has been included, because it was considered as forming part of the Punjab, and until a short time ago the districts across the Indus were part of the Punjab.

Kashmir was included as it is impossible to form a satisfactory boundary in that direction, the greater number of the plants found in Kashmir grow in other parts of the Himalaya that are situated in the Punjab.

This little book is not intended to take the place of a complete Flora, but to be used as a guide in helping to identify with less trouble any plant in the area. Each plant is supplied with a short description consisting of a few characters differentiating it from other plants.

This book forms an abbreviated Flora of the area, as in it is included probably every plant, excepting Grasses and Ferns, that has been found in the area. A large proportion of the plants have been examined by the author while they were still fresh.

He is much indebted to such works as the Flora of British India, the Flora of the Upper Gangetic Plain, the Flora Simlensis, and the Forest Flora of the School Circle, United Provinces, for the descriptions of plants with many of which he is unacquainted.

This is a suitable opportunity for thanking friends for the assistance which they have given to one, who has but a superficial knowledge of the science of botany.

INTRODUCTION.

The method of classification that has been adopted in this work is the division of all flowering plants except grasses into erect plants, consisting of trees, shrubs and herbs : climbers, which are sub-divided into twining plants, that is, plants which grow in height by twining round supports or sprawling over them ; tendril bearing plants, such as climb and cling to supports with the help of tendrils ; leaf climbing plants which have sensitive leaves, which twine round supports ; hook climbing plants, which climb over supports and have hooks or thorns to aid them : root climbers, such as climb by the aid of adventitious roots on the stem ; prostrate plants, that lie on the ground ; parasites, plants that draw the whole or part of their nourishment from other plants, these are sub-divided into total parasites and partial parasites : water plants, plants which grow in water and are descended from land plants as they possess flowers which require wind or insects for their fertilization ; leafless plants, which include many parasites.

Where it has proved necessary the above classes have been subdivided again into those plants with opposite and those with alternate leaves, these again have been separated into those with stipules (stipulate) and those without stipules (exstipulate) and these still further sub-divided into those with simple, those with lobed, and those with compound leaves.

Even these divisions are not sufficient to differentiate every single plant, it has therefore proved a necessity to supply a short description. The descriptions are arranged according to the sequence of the natural orders in Bentham and Hooker's Genera Plantarum.

Under the botanical name of each plant are the English and Urdu names, if any are known, then follows a reference to the page and volume of the Flora of British India where the full description of the plant will be found, to this has been added the habitat of the plant.

In cases where plants comply sometimes with the characteristics of one class and at other times with those of another class, the plant has been described in one class and merely a cross reference given in the other. Such cases occur among plants which may be at some elevations, trees and at others merely shrubs.

Plants, which are commonly found to have established themselves as escapes or to be cultivated, but are not indigenous in the area, have been entered here.

It is essential to have good sight or to use a magnifying glass in examining plants: this is especially necessary in noting the presence or absence of stipules, as they are often very minute. Young shoots should always be selected in examining the leaves for stipules, as in many plants the stipules wither and fall off, while the leaves are still young. In identifying herbs the whole plant should be examined, as the character of the portion underground is of importance in the process of identification.

GLOSSARY.

Alternate.—When a leaf has no leaf at the same level on the opposite side of the stem or branch it is called Alternate.

Anther.—See Stamen.

Berry.—A fruit fleshy or pulpy throughout surrounded by a skin with the seeds immersed in the pulp.

Bipinnate.—When the secondary as well as the primary divisions of a leaf are pinnate.

Bract.—A scale more or less leaflike situated below the calyx of a flower or collection of flowers.

Bracteole.—The bract, which is nearest to the flowers.

Calyx.—The outer envelope of the flower, where there are two dissimilar envelopes.

Capsule.—A dry seed vessel (fruit) consisting of one or more parts (carpels).

Carpel.—One of the component parts of a fruit or seed vessel.

Climbers.—Plants which throw their weight upon external supports and grow fast, as they do not require to form the fibres for an erect stem.

Compound.—Applied to a leaf when it is divided into one or more leaflets jointed on to one stalk.

Cone.—The compound fruit of Pinus and other plants of the coniferæ (cone bearers).

Corolla.—The inner envelope of the flower, where there are two dissimilar envelopes, usually the most showy part, it may consist of separate petals or united portions (corolla).

Dentate.—Toothed as the margin of a leaf, notched with small triangular processes.

Digitate.—A compound leaf is digitate when it has several leaflets radiating from the extremity of the leaf stalk.

Drupe.—A fleshy fruit having a stone enclosing the seed or kernel.

Epiphyte.—A plant growing upon another without drawing nourishment from it.

Erect.—Applied to plants which have stems that support their weight without external support.

Exstipulate.—Having no stipules, *see* Stipules.

Follicle.—A several seeded carpel splitting open along one side only.

Fruit.—The seed vessel of any plant, edible or inedible.

Head.—A Collection of small flowers sessile on one base, looking like one flower as in the dandelion or daisy.

Herb.—A plant which possesses very little woody stem above ground, and usually dies down in the autumn or after flowering, and is annual or perennial.

Keel.—The two more or less combined petals, forming together an angle as in the Pea.

Lanceolate.—Of leaves nearly ovate, but tapering to both ends, and broadest below the middle.

Leaflets.—The articulated (jointed) primary divisions of a pinnate compound leaf and the secondary divisions of a bipinnate leaf.

Ligulate.—Strap shaped.

Linear.—Narrow with almost parallel edges.

Lobe.—The division of a leaf, of a leaflet or of a petal.

Nut.—A large one-seeded unopening dry fruit.

Nutlet.—A small one-seeded dry unopening fruit, or one of the divisions of the fruit of the Boraginaceæ or Labiatæ.

Opposite.—When a leaf has one or more leaves at the same level and usually on the opposite side of the branch.

Ovate.—Egg-shaped.

Palmate.—Lobed in the shape of a hand.

Pappus.—The calyx of the Compositæ, formed of hairs, bristles or scales.

Parasite.—A plant that grows upon another and derives its nourishment from it.

Perianth.—The floral envelopes—corolla and calyx, but often used to denote the floral envelope, when the flower possesses only one.

Peltate.—Applied to a leaf when its stalk (petiole) is within the margin.

Petals.—The lobes of a corolla.

Pinnate.—Compound leaves with leaflets arranged like the pinnules of a feather along both sides and at the end of a common stalk, are styled pinnate.

Pinule or Pinna.—One of the primary divisions of a bipinnate leaf.

Raceme.—A collection of flowers, nearly equally stalked and arranged singly along a common stalk.

Rhizome.—A creeping, generally underground stem giving off erect stems at intervals.

Sepals.—The lobes of a calyx.

Sessile.—Stalkless.

Shrub.—A woody perennial plant of not more than 30 feet in height and much branched down to the level of the ground: this includes undershrubs.

Simple.—Applied to leaves which are undivided.

Spadix.—A spike of flowers enclosed in a leafy bract (spathe).

Spathe.—A leafy bract enclosing a spike of flowers.

Spathulate.—Applied to a leaf that is oblong and tapers down into a stalk.

Spike.—A collection of sessile flowers on a common simple or branched stalk.

Spine.—A sharp woody outgrowth.

Spurred.—Having a hollow tubular projection.

Stamens.—The male organs consisting of a thread (filament) with a head (anther) containing pollen found within the petals in the flower centre.

Stigma.—*See* Style.

Stipules.—Bract-like growths at the base of some leaf stalks, sometimes leafy or spinous. Stipulate having stipules.

Stipels.—Secondary stipules, at the base of the leaflets of compound leaves.

Style.—One or more thread-like processes in the centre of the flower with a single or divided head (stigma).

Tendril.—A twining organ by means of which some plants climb.

Tree.—A perennial plant with a woody stem which branches out above and generally grows to more than 30 feet in height.

Tube.—The united part of the calyx or corolla.

Tuber.—An underground fleshy stem.

Unarmed.—Destitute of spines or prickles.

Winged.—Supplied with a leafy or membranous expansion.

ERECT PLANTS.

TREES.

TREES WITH OPPOSITE STIPULATE LEAVES.

SIMPLE LEAVES.

Euonymus tingens,	see Trees, Opposite, Exstipulate, Simple.
Stephegyne or **Mitragyna parvifolia,** *Kaèm.* RUBIACEÆ. F. B. I. iii. 25. The Plains to 4,000 feet.	medium size; trunk buttressed; leaves 2-6 in. long, leathery, variable in shape, stipules pale membranous; flowers white, or light yellow in round heads 1 in. diam.; corolla trumpet shaped, lobes 5, stamens 5, on the throat of the corolla; capsule, ⅛ in. 100-150 in each head, seeds many winged, minute.
Wendlandia exserta, RUBIACEÆ. F. B. I. iii. 87. Himalaya up to 4,000 ft.	small; young shoots grey woolly; leaves 5-9 in long, grey woolly on under surface, stipules recurved; flowers small, white, fragrant, in dense terminal branching racemes, calyx lobes 4-5, persistent, corolla funnel shaped, lobes 4-5, stamens 4-5; fruit dry woolly round, seeds minute many.
Randia dumetorum,	see Shrubs, Opposite, Stipulate, Simple.
Morinda tinctoria, *Al, aoh.* RUBIACEÆ. F. B. I. iii. 156. The Plains, East of the Sutlej river.	small; branches four angled, woolly; leaves 4-8 in. long, pointed at both ends, woolly on both surfaces, stipules sheathing with divided points; flowers in round heads, white, corolla about 1 in. long, lobes 4-7, stamens 4-7; fruit, 1 in. diam. composed of many drupes joined together.
Ficus hispida,	see Shrubs, Opposite, Stipulate, Simple.

COMPOUND LEAVES.

Staphylea Emodi, *Nagdaun, marchob*; SAPINDACEÆ. F. B. I., i. 698. Himalaya, 6-9,000 feet. Narkunda (Collett).	small; bark spotted and streaked; leaves long, stalked, pinnate, two lateral leaflets sessile, terminal one stalked; flowers white, in long hanging racemes; sepals and petals alike, white, 5, erect, stamens 5; capsule dry papery, 2-3 in. long, 3 lobed and 3 pointed at the top.
Dolichandrone stipulata, BIGNONIACEÆ. F. B. I. iv. 379. The Plains. Gujranwalla, planted.	large; branchlets and flowering parts covered with easily separating yellow or brown wool; leaves 1-1½ feet long, leaflets 3-5 pairs; flowers yellow brown, woolly, corolla tubular, 2-3 in. long; calyx, cleft on one side to the base, stamens 4, in two pairs facing each other; capsule, 18-24 in. by 1 in., very woolly.

TREES WITH OPPOSITE EXSTIPULATE LEAVES.

SIMPLE LEAVES.

Euonymus tingens, *Chopra, Kunghu.* CELASTRACEÆ. F. B. I. i. 610. Himalaya, 6-10,000 ft. Simla (Collett).	small; leaves thick, leathery, 1-3 in. long; flowers ½ in. diam., yellowish white with purple veins; calyx lobes 5, fringed, petals 5, stamens 5; fruit is a capsule, 4 or 5 lobed, opening to show a red interior in which the seeds are embedded, the capsule is angled. The inner bark yields a yellow dye.
Acer oblongum, **Maple,** *Mark.* SAPINDACEÆ. F. B. I. i. 693. Himalaya, 2-6,000 ft. Simla, the Glen (Collett)	large; leaves smooth, oblong, 3-6 by 1-2 in., long pointed, upper surface dark green, lower white; flowers in terminal or leaf bearing lateral clusters, sepals and petals 5, $\frac{1}{10}$ in. long, stamens 8, smooth, fruit winged, back of wing straight.
Acer laevigatum, SAPINDACEÆ. F. B. I. i. 693. Himalaya, 5-9,000 ft.	large; leaves smooth, oblong, 2½-5 by 1-2 in., lower surface green; flowers in loose terminal branching racemes, sepals and petals 5, stamens 5-8, smooth; fruit winged, wings reddish, back curved.
Psidium guyava, **Guava,** *Amrut.* MYRTACEÆ. F. B. I. ii. 468. The Plains to 2,000 ft.	small; bark smooth, pinkish, peeling off in flakes; leaves 3-4 inches long, ovate, principal nerves prominent; flowers large, white, petals ununited, calyx 4-5 lobed, stamens many; fruit rough skinned 2-3½ in. diam., succulent, edible, in the centre a mass of pulp, in which many small seeds are embedded, strongly scented.
Eugenia Jambolana, *Jaman.* MYRTACEÆ. F. B. I. ii. 499. The Plains to 5,000 ft.	large; leaves smooth, shining leathery 3-6 in. long, covered with minute shining dots: flowers pale-green, ¼-½ inch long, crowded in small round clusters, calyx tube, funnel shaped, petals united into a hood, stamens in several series; fruit succulent, edible, dark purple when ripe, stone one.
Lagerstrœmia parviflora, *Bakli, dhaura.* LYTHRACEÆ. F B I. ii. 575. The Plains to 1,000 ft.	small; bark ash coloured or light brown smooth, peeling off in flakes; leaves 2-3½ in. long, smooth; flower white, ¼ in. across, fragrant, sepals 6, petals 6, narrow with a wavy margin, long stalked, wrinkled stamens very many and long; capsule attached to woody calyx ¾-1 in. long, seeds many, winged at the top, ½ in. long.

TREES WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

Lagerstroemia Flos-Reginæ, *Jarul.* LYTHRACEÆ. F. B. I. ii. 577. The Plains.	large; leaves 4-8 in. long; spines sometimes on the trunk and branches of old trees; flowers 2-3 in across, mauve, petals long, stalked, wavy; capsule 1½ in. long, seeds winged.
Cornus macrophylla, *Halso, kasir.* CORNACEÆ. F. B. I. ii. 744. Himalaya, 4-8,000 ft. Simla (Collett).	large; bark brown, rough, leaves sometimes a few alternate, 6-4 in. long, long pointed; flowers small, in bunches, often 4-5 in. diam., calyx covered with white hairs, petals 3-4½ in. long, strap shaped, stamens 4; fruit round, ¼ in. diam., crowned with the remains of the cup-shaped calyx.
Cornus oblonga, *Kagshi, bakar.* CORNACEÆ. F. B. I. ii. 744. Himalaya, 4-7,000 ft. Simla (Collett).	small; bark reddish brown, rough; leaves sometimes a few alternate, 2-6 by ¾-1½ in. narrowly oblong; flowers as above; fruit ovoid, ¼ in diam., crowned as above.
Cornus capitata, The Strawberry Tree, *Tharwar, thesi.* CORNACEÆ. F. B. I. ii. 745. Himalaya, 4-7,000 ft. Simla (Collett).	small; bark greyish brown; young branches and leaves rough with short close clinging two pointed hairs; leaves opposite 2-3½ by 1¼-1½ in. oblong or ovate; flowers in heads rounded ½ in. diam. with four yellowish white bracts 1 by ½ in. petal-like, calyx, teeth 4, reflexed, petals 4, stamens 4; fruit a depressed round strawberry-like head of many minute drupes, one seeded, edible.
Olea Cuspidata, The Olive, *Kahu.* OLEACEÆ. F. B. I. iii. 611. Himalaya, 2-6,000 ft.	small; bark thin, peeling in narrow strips when old, leaves 2-4 in. long, leathery, oblong, tip hard, acute, smooth, shining above, covered beneath by minute red scales; flowers small, white, in numerous short branching racemes in the axils of leaves, corolla rotate deeply divided, tube short, lobes 4, stamens 2; drupe ¼—½ in. long, ovoid, black when ripe, stone hard, one seeded.
Olea glandulifera, *Gulili, phalsh.* OLEACEÆ. F. B. I. iii. 611. Himalaya, 2-6,000 ft.	medium size; bark rough, branches with lentil shaped corky excrescences; leaves ovate 4-5 by 1½ in., long pointed, glands on the under surface; flowers cream coloured in terminal or lateral branching racemes 2-3 in. long, corolla deeply divided; drupe ⅓-½ in. long, ovoid, acute at the top, black when ripe, stone as the last.

TREES WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

Ligustrum compactum, see Shrubs, Opposite, Exstipulate, Simple.

Salvadora persica, see Shrubs, Opposite, Exstipulate, Simple.

Salvadora oleoides, see Shrubs, Opposite, Exstipulate, Simple.

Carissa carandas, see Shrubs, Opposite, Exstipulate, Simple.

Holarrhena antidysenterica,
Kura.
APOCYNACEÆ.
F. B. I. iii. 644.
Himalaya to 8,500 ft.
Valleys below Simla (Collett).

small. bark rough brown, peeling off in irregular flakes; leaves 6-12 by 2-5 in. smooth; flowers white or cream colour, scented, 1-1½ in. across in large bunches 3-6 in. diam., calyx 5 lobed, petals united in a tube, stamens 5 at the base of the tube; fruit of two distinct follicles, 8-16 by ⅓-½ in. in-curved covered with white dots, seeds many ½ in. long, linear crowned with hairs 1½-2 in. long, brownish yellow. The powdered bark cures chronic dysentery.

Wrightia tomentosa,
Dudhi.
APOCYNACEÆ.
F. B. I. iii. 653.
The Plains to 2,000 ft.

small; bark corky; leaves 3-6 by 1½-3 in., long pointed, woolly often on both surfaces, always on the under surface; flowers pale yellow, 1 in. across in large bunches, petals united in a tube, round flat on top, scales within, stamens 5, at the top of the tube converging; fruit of two united follicles with two grooves, 8-12 by ½-¾ in. straight; seeds many ½ in. long with white silky hairs at the lower end.

Tecoma undulata,
Rohira, lahura.
BIGNONIACEÆ.
F. B. I. iv. 378.
The Plains to 3,000 ft.

small; leaves 3-5 by ½-1 in., narrowly oblong, margin wavy, blunt tip; flowers 2-3 in. long, orange, in few flowered, clusters on lateral branches, calyx ½ in. long, lobes 5, blunt, corolla 1½ to 2 in. long, tubular lobes 5, round, stamens 4 in pairs, opposite to each other, within the corolla; capsule, linear 8 by ½ in., slightly curved, seeds thinly discoid, with wing 1 by ½ in., wing very narrow round the top.

Tectona grandis,
Teak,
Saigun.
VERBENACEÆ.
F. B. I. iv. 570.
The Plains.

large; branchlets 4 angled, felted with star shaped hairs; leaves 12 by 8 in., wedge shaped at both ends, felted beneath, ovate, stalk 1 in. long; flowers whitish blue, small, numerous in terminal branching racemes 18 in. diam., calyx small, large in fruit, corolla ' in. long, 5 lobed; drupe ⅝ in. diam., hairy, 4 celled, bony.

TREES WITH OPPOSITE EXSTIPULATE SIMPLE LEAVES.

Gmelina arborea, *Kumhar.* VERBENACEÆ. F. B. I, iv. 581. The Plains to 2,000 ft.	large ; bark grey, smooth, peeling in flakes, branchlets with white specks ; leaves 4-8 by 3-6 in., broad ovate hollowed at the base, pointed, velvety beneath, stalk 3-6 in. long, flowers 1-1½ in. long, tubular, 2 liped brownish yellow in terminal branching racemes calyx ⅕ in., corolla lobes 5-4, stamens 4 ; drupe ovoid ¾-1 in. long, skin leathery yellow, succulent, edible, stone 4-2 celled, seeds oblong. The bark and seeds are used medicinally.

PETALS NONE.

Cinnamomum Tamala, *Dalchini.* LAURINACEÆ. F. B. I., v. 128. Himalaya, 3-5,000 ft.	leaves both opposite and alternate, sometimes on the same twig, 4-6 by 1½-2½ in., smooth, shining above, pointed, pink when young ; flowers white ⅕-¼ in. long in branching racemes, the length of the leaves, calyx lobes 6, unequal, silky, petals none, stamens 9 in 3 series ; drupe ½ in. long ovoid succulent, black when ripe ; supported by the thickened stalk and 6 toothed calyx. The bark is used instead of true cinnamon.
Elæagnus hortensis,	see Trees, Alternate, Exstipulate, Simple.
Buxus Sempervirens,	see Shrubs, Opposite, Exstipulate, Simple.
Cupressus torulosa, **Cypress,** *Devidar.* CONIFERÆ F. B I., v. 645. Himalaya, 5,500—8,000 ft.	large with pyramidal crown and drooping branchlets, branches spreading, outline of tree narrowly conical ; leaves scale-like, triangular, overlapping, catkins terminal, cylindrical, with opposite target shaped scales with 2-6 anther scales near the edge ; fruit round, head of scales closed, open when ripe, seeds ⅕ in. with round wing.

TREES WITH OPPOSITE EXSTIPULATE LOBED LEAVES.

PETALS UNUNITED.

Acer pentapomicum, **The Maple,** SAPINDACEÆ. F. B. I. i. 693. Himalaya, 3-4,000 ft.	large ; twigs grey or reddish leaves, three lobed 1½-4 by 2½-6 in., pale on both sides, stalks 1½-4 in calyx 4-5, toothed, petals none, stamens 8 ; fruit smooth, wings with back nearly straight.
Acer cæsium, SAPINDACEÆ. F. B. I. i. 695. Himalaya, 7-10,000 ft.	large ; leaves, five lobed, palmate, 3½-7 by 4-8 in., stalks 2½-6½ in. long, flowers in long bunches arranged along a stalk which is nearly as long as the leaves and appears after them, male and female on different trees, petals small, cream coloured.

TREES WITH OPPOSITE EXSTIPULATE LOBED LEAVES.

PETALS UNUNITED.

Acer villosum,
SAPINDACEÆ.
F. B. I. i. 695.
Himalaya, 7-9,000 ft.

large ; leaves 5 lobed, 3½-10 in. diam., stalks 2-5 in. ; flowers in long bunches, branched and hairy, and appearing before leaves and shorter than the leaves, petals 5, short white, fruit with wings slightly curved.

Acer caudatum,
SAPINDACEÆ.
F. B. I. i. 695.
Himalaya, 7-11,000 ft.

large ; leaves 5 lobed, lobes narrowed into long tail-like tips, flowers on short stalked bunches and appearing with the leaves, sepals oblong, whitish, petals shorter than sepals, stamens 4-6 ; fruit smooth, wings pink, back moderately curved.

Acer pictum,
Tilpattar
SAPINDACEÆ.
F. B. I. i. 696.
Himalaya, 4-6,000 ft.

small ; leaves five to seven lobed 2½-5½ by 2½-6½ in., stalks 1-4½ in., lobes lanceolate ; flowers in long stalked bunches appearing with the leaves, sepals 1/10 in. long, oblong, petals equal to sepals in length, stamens 8 short ; fruit differs from all the above by the wings diverging into a nearly straight line.

TREES WITH OPPOSITE EXSTIPULATE COMPOUND LEAVES.

Æsculus Hippocastanum, Horse Chestnut,
SAPINDACEÆ.
F. B. I. i. 375.
Himalaya, 4-10,000 ft.

large ; bark stripping in long pieces, buds scaly ; leaves digitately compound, stalk 4-6 in. long, leaflets 5-9, 8-12 by 2½-4 in., the middle one largest oblong, long pointed, toothed ; flowers white, 1 in. long, irregular, in small velvety clusters arranged in erect terminal pyramidal branching racemes 12-15 in. long, calyx tubular, 5 lobed, petals 4, stalked, white, yellow and red streaks, 2 petals narrow, stamens 7 ; capsule prickly, brown ovoid, 1-2 in. diam. with 1-3 seeds, rounded, dark-brown with a greyish scar on one side.

Æsculus indica, Indian Horse Chestnut,
Gun, torjaga, hane.
SAPINDACEÆ.
F. B. I. i. 675
Himalaya, 4-10,000 ft.
Simla, Narkanda (Collett).

is very like the last species but the leaflets are smaller and the capsule is smooth.

Fraxinus floribunda,
Angu, hum, tunnu.
OLEACEÆ.
F. B. I. iii. 605.
Himalaya, 5-9,000 ft.

large ; bark grey, smooth on young stems, deeply furrowed on old ; leaves odd pinnate, midrib 5-8 in. long, leaflets opposite, 5-9, 3-5 by 1-3 in. long, pointed, toothed ; flowers small, white, in clusters on

TREES WITH OPPOSITE EXSTIPULATE COMPOUND LEAVES.

a large branching terminal raceme 6-8 in. long, calyx minute, 4-toothed, petals 4, stamens 2 ; a winged dry nut, one seeded 1 1½ in. long. Manna exudes from the bark by incision.

Millingtonia hortensis, Indian Cork tree,
Akas Nim.
BIGNONIACEÆ.
F. B. I. iv. 377.
The Plains.

large, towering, branches drooping, bark corky. leaves 2-3 ft. long, 2-3 pinnate, leaflets 2-3 in., ovate lanceolate, long pointed ; flowers white, scented, on terminal branching racemes 10 by 6 in., calyx $\frac{1}{12}$ in., teeth 5, corolla tube 2-3 by $\frac{1}{16}$ in., mouth 1 in. diam., lobes 5, nearly equal, ovate, stamens 4, slightly protruding ; capsule 12 by ¾ in., pointed at both ends, seeds with wing 1 by ½ in. discoid.

Oroxylum indicum,
Mulin, tatmorang.
BIGNONIACEÆ.
F. B. I. iv. 378.
The Plains to 3,000 ft.
Valleys below Simla (Collett).

medium size, bark soft corky, branches few ; leaves 2-3 pinnate, 4-6 feet long, pinnæ 3-4 pairs, pinnules 3-4 foliolate, leaflets 3-5 by 2-3½ in., broad ovate, long pointed ; flowers dark red, odour bad, large fleshy in loose terminal racemes, main stalk 2-3 feet, calyx 1 in. long, leathery, hardly toothed, corolla bell-shaped, 2-3 in. long, lobes 5, stamens 5, 4 nearly equal, fifth shorter ; capsule 15-30 by 2-4 in., flat, like a scabbard, seeds discoid with papery wing, 2-3 in. across. The bark is used as an astringent.

PETALS NONE.

Fraxinus excelsior, Common ash,
Sum, hum.
OLEACEÆ.
F. B. I. iii. 606.
Himalaya, 4-9,000 ft.

large ; leaves odd pinnate, leaflets 3-11, 4 by 1¾ in., sessile, long pointed, toothed ; flowers in short racemes clustered at tips of branches appearing before the leaves, no sepals or petals, stamens 2 short; a winged dry nut, 1-1½ in. long, one seeded.

Fraxinus Xanthoxyloides,
Hanuz, shangal.
OLEACEÆ.
F. B. I. iii. 606.
Himalaya, 3-9,000 ft.

small ; leaves odd pinnate, leaflets 7-11, 2 by ¾ in., not long pointed, small teeth ; flowers in very short dense clusters, brown from woolly bracts, no calyx in some flowers, petals none ; fruit as in the last species.

Trees with Alternate Stipulate Simple Leaves.

Petals Ununited.

Bixa Orellana, **Arnatto,** *Latkan.* BIXINEÆ. F. B. I. i. 190. The Plains.	small, evergreen, young shoots rusty velvety; leaves 4-8 by 2½-5 in., smooth, long pointed, stalk 2-3 in. slender, stipules minute; flowers white or pink, 2 in. diam., in terminal branching racemes, sepals 5, petals and stamens many; fruit 1½ in., ovoid softly prickly, seeds many in pulp, from this the orange dye is extracted.
Shorea robusta, *Sal.* DIPTEROCARPEÆ. F. B. I. i. 306. Kangra Valley, Himalaya, east of the Sutlej river to 3,000 ft.	large, young parts with greyish velvet, bark thick, dark grey, rough from irregular furrows; leaves 6-10 by 4-6 in., ovate oblong, long pointed, smooth stalk 1 in. long, stipules curved, ⅓ in. long, soon falling off; flowers yellowish, shortly stalked in branching terminal or axillary loose racemes, 5-9 in long, covered with greyish velvet, calyx and outside of petals with greyish velvet, petals 5⅓ in. long, orange within, tapering upwards, stamens 50; fruit ovoid, ⅓ in. long with greyish velvet attached to the enlarged sepals, which form five unequal wings, seed one; wood and resin are valuable.
Kydia calycina,	see Trees, Alternate, Stipulate, Lobed.
Grewia oppositifolia, *Behel.* TILIACEÆ. F. B. I. i. 384. Himalaya to 7,000 ft.	medium size, bark ash coloured, herbaceous parts more or less with stellate hairs; leaves 3 in. long in two rows along branches, ovate long pointed, minutely toothed, rough above, velvety beneath, stalks ⅓ in., stipules more than ⅓ in. linear, soon falling off; flowers in short clusters, opposite to leaves, white to yellow, sepals 5, linear ¾ in. long, 3 ribbed on the back, petals 5, half the length of the sepals, stamens many; drupe smooth or thinly hairy, fleshy, dark green, one to four lobed, nuts one celled, one seeded, size of peas.
Grewia vestita, or, **Asiatica,** *Dhaman.* TILIACEÆ. F. B. I. i. 387. Salt range, The Plains to 4,000 ft.	small, herbaceous parts covered with yellowish velvet; leaves 5-6 in. long, round or broadly ovate, round to long pointed at the apex, somewhat lobed, woolly on both surfaces, less so when mature, stalks ⅓-¾ in. long, stipules curved often with a broad base; flowers ¾ in. diam. in clusters of 3, axillary, buds woolly, ribbed, sepals 5, brown woolly outside, yellow smooth inside, petals 5, half the length of sepals, oblong, yellow, stamens many; drupe round, ¼

TREES WITH ALTERNATE STIPULATE SIMPLE LEAVES.

PETALS UNUNITED.

	in. diam., partially two lobed with one to two, one celled nuts.
Ilex dipyrena, Himalayan Holly, *Kandera.* ILICINEÆ. F. B. I. i. 599. Himalaya, 5-8,000 ft. Simla (Collett).	medium size ; branches thick, young shoots slightly hairy ; leaves 3-4 in. long, dark green, shining leathery, spinous toothed, without spines when old, stipules minute ; flowers 1/5 in. diam., whitish green in short round axillary clusters, sepals 4, petals 4, stamens 4 ; drupe ½ in. diam., round, scarlet, stones usually 2, deeply grooved.
Ilex odorata. ILICINEÆ. F. B. I. i. 599. Himalaya 3-6,000 ft. Valleys below Simla (Collett).	small ; branches thinner than those of the last species ; leaves 5-7 or even 9 in. long, not spinous but minutely toothed, stipules minute ; flowers ⅛ in. diam., white in dense short axillary clusters, sepals 4, petals 4, stamens 4, much longer than the petals ; drupe ¼ in. diam., round, black, stones 4, 3-angled.
Zizyphus Jujuba, *Ber.* RHAMNEÆ. F. B. I. i. 632. The Plains to 6,000 ft., Simla (Collett).	small, thorny, bark dark grey, inside reddish, young parts with densely greyish brown velvet ; leaves 1-4 in. long, ovate, nearly round, dark green and smooth above, grey velvety beneath, stipules of one straight spine or two spines, one of them short and curved back ; flowers greenish-yellow in short axillary nearly sessile clusters, petals 5, bent down, stalked, concave, stamens 5 ; drupe ½-¾ in. long, ovoid or round, orange to red when ripe, stone two-celled, bony.
Zizyphus vulgaris,	see Shrubs, Alternate, Stipulate, Simple.
Berchemia floribunda.	see Climbers, Alternate, Stipulate, Simple.
Rhamnus dahuricus, or virgatus, Indian Buckthorn, *Chato, kanji.* RHAMNEÆ. F. B. I. i. 639. Peshawar, Himalaya, 4,500-9,000 ft.	small, much branched, shoots short and the end becomes dry, hard and pointed, thus forming a spine, two lateral shoots grow from below the spine, thus a spine is found in the fork between two branches and leaves clustered on the lower part of spines ; bark dark grey thin ; shining peeling in rolls ; leaves alternate, nearly opposite, ¾-2 in. long, lanceolate, long pointed ; stipules soon falling off, linear,

TREES WITH ALTERNATE STIPULATE SIMPLE LEAVES.

PETALS UNUNITED.

minute ; flowers greenish, in axillary clusters, sepals 4, petals 4, minute linear, stamens 4 ; fruit ¼ in. long ovoid, seated on the persistent calyx, seeds grooved. In China Green Indigo is made from the bark.

Hovenia dulcis,
Chamhun, sirka.
RHAMNEÆ.
F. B. I. i. 640.
Himalaya, 3-6,500 ft.

medium size, trunk straight ; leaves 4-6 by 2-3 in., ovate, long pointed, in two rows, toothed, woolly beneath, stalk ½ in. long, stipules small, soon falling off, flowers white, in terminal and axillary clusters, sepals 5, petals 5, stalked, stamens 5, longer than the petals ; fruit ¼ in. diam., round nearly three lobed, three celled and three seeded, the fruit stalk enlarges, becomes fleshy, tastes like a pear, edible.

Bauhinia retusa.
Kurál, kandla.
LEGUMINOSÆ.
F. B. I. ii. 279.
Himalaya to 4,000 ft.
Valleys below Simla (Collett).

medium size, bark dark brown, generally scored by diagonal cuts, made to obtain the gum ; leaves sometimes cleft at the end, 4-6 in. diam., broader than long, velvety beneath, stalk 1½-3½ in. long ; flowers in terminal branching velvety racemes up to 12 in long, flowers ½ in. long, pale yellow with purple streaks, petals oblong ⅛ in. stalked, stamens 10, only 3 perfect ; pod 4-6 by 1½ in. flat, reddish seeds 6-8.

Prunus Amygdalus,
The Almond,
Badam.
ROSACEÆ.
F. B. I. ii. 313.
The Plains to 10,000 ft.

small, bark brownish grey, smooth, leaves 3 in. long, oblong lanceolate, minutely toothed, thin, stalk ½ in. long, with two glands, stipules fringed ; flowers pink, stalked, ¾ in. diam., appear before the leaves, petals 5, stamens many, drupe 1½ in. long velvety, opening in two pieces, stone large flattened covered with shallow wrinkles and minute holes, seed flattened, long oval, seed edible.

Prunus persica,
The Peach,
Aru.
ROSACEÆ.
F. B. I. ii. 313.
The Plains to 10,000 ft.

small ; bark brownish, rough, branches thick, leaves 3-5 by ¾-1¼ in., oblong, lanceolate, small teeth, thicker than the last and darker green, stalk ½ in., stipules fringed ; flowers 1 in. diam., sessile, dark pink, appear before or with the leaves, petals 5, stamens many ; drupe 1½-2½ in. long, round or flattened, very velvety, not opening in two pieces, fleshy, edible, sweet, green with a tinge of red when ripe, stone deeply and irregularly furrowed, thick.

Prunus Armeniaca, The Apricot, *Zardalu.* ROSACEÆ. F. B. I. ii. 313. Himalaya to 11,000 ft.	small, bark light brown; leaves 2-3½ in. diam., broad ovate, pointed, minutely toothed, long stalked, stalk 1-1½ in. long, flexible, with two glands, stipules lanceolate; flowers appearing with or after the leaves, ¾ in. diam., white, shortly stalked, petals 5, stamens many; drupe yellow, or sometimes black in Kashmir, 1-1½ in. long, velvety or nearly smooth, fleshy, not opening in two pieces, stone thick with a prominent thickened grooved margin.
Prunus Avium, The Sweet Cherry or Gean, ROSACEÆ. F. B. I ii. 313. Himalaya to 8,000 ft.	small, bark brownish grey, smooth, roots without sprouting shoots; leaves flaccid, drooping, acutely toothed, oblong ovate, broader at the apex, velvety beneath, stalk long with two glands: flowers appearing with the leaves, white, long stalked in clusters, petals 5, spreading, stamens many; drupe ¼-½ in. diam., round, smooth, shining, sweet or bitter, stone smooth.
Prunus Cerasus, The Wild Cherry, *Gilas, olchi.* ROSACEÆ. F. B. I. ii. 313. Himalaya to 8,000 ft.	small, bark brownish grey, smooth, roots with many sprouting shoots, leaves 2-3 by 1-1¼ in., ovate, abruptly long pointed, erect, firm shining, minutely toothed, smooth beneath, stalk short, without glands; flowers appearing with the leaves, white, on long slender stalks in clusters of 2-5, petals 5, erect, stiff; drupe ¼-½ in. diam., round, smooth, shining, stone round smooth.
Prunus Puddum, *Padam.* ROSACEÆ. F B. I. ii. 314. Himalaya, 3-6,000 ft. Valleys below Simla (Collett).	medium size, bark smooth, brownish grey, peeling in strips; leaves 3-5 by 11-½ in., ovate, lanceolate, very long pointed, sharply glandular toothed, smooth, shining, stalk ½ in. long with 2-4 glands at the base, stipules long, divided into 3-5 segments, fringed with glands; flowers appearing before the leaves, 1 in. diam., pink fading to white, solitary or in small clusters towards the ends of branchlets, stalked petals 5 oblong, obtuse stamens many; drupe ovoid ½-¾ in. long, flesh scanty, yellow or reddish, acid, stone, wrinkled and furrowed.

Trees with Alternate Stipulate Simple Leaves.

Petals Ununited.

Prunus Communis, **Bullace,** *Aluchu.* Rosaceæ. F. B. I. ii. 315. Himalaya, 5-7,000 ft.	small, branching from below, with or without thorns; leaves 3-4 in. long, ovate, lanceolate short pointed, finely toothed; flowers 1 in. diam., appearing with the leaves, white or pinkish on long stalks, solitary or in pairs, petals 5, stamens many; drupe 1½ in. round or ovoid, drooping, smooth, with bloom, yellow or black, stone flattened, smooth.
Prunus Padus, **Bird Cherry.** *Jamoi.* Rosaceæ. F. B. I. ii. 315. Himalaya, 6-9,500 ft. Simla (Collett).	medium size, bark rough, dark grey or brown, young parts somewhat velvety; leaves 4-6 by 1-2½ in. oblong lanceolate, long pointed, closely toothed, red before falling, midrib red, stalk 1-1½ in. long, stout, red, a pair of glands at apex, stipules linear, membranous, soon falling: flowers white, ⅓-½ in. diameter, in drooping many flowered axillary and terminal racemes, which are 4-6 in. long, petals 5, concave, stamens many; drupe size of a pea, round acid, red turning to black, stone thick, rugged.
Eriobotrya Japonica, **Loquat,** *Lokat.* Rosaceæ. F. B. I. ii. 372. The Plains.	small, branches and branchlets thick; leaves 6-8 by 1½-3 in., leathery, stiff woolly beneath, stalk thick, woolly, stipules broad or lanceolate; flowers white, ½ in. diam., crowded in thick stiff woolly racemes, petals 5, broad, ovate; berry round or ovoid 1½-2 ins. long, yellow, fleshy, edible, seeds 2-5, angled, brown, smooth. This tree is much cultivated for its fruit.
Pyrus Malus, **Apple,** *Seo.* Rosaceæ. F. B. I. ii. 373. The Plains to 9,000 ft.	leaves 2-3 in., ovate, smooth above, woolly beneath, leaf stalk woolly, flowers pink, 1½-2 in. diam.; sepals persistent on the top of the fruit; fruit globose, fleshy, 2-5 celled, seeds contained in a core, fruit indented at both ends and with a very short stalk.
Pyrus baccata, **Siberian Crab,** *Lu, choda.* Rosaceæ. F. B. I. ii. 373. Himalaya 6-10,000 ft.	small; leaves 2-3 in., smooth, ovate, flowers 1½-2 in. diam., sessile in clusters, white; fruit small, ½-1 in. diam., globose, red, sepals not on the top, seeds in a core, only base indented, flesh of fruit granular.

TREES WITH ALTERNATE STIPULATE SIMPLE LEAVES.

PETALS UNUNITED.

Pyrus communis, Pear, *Nashpati.* ROSACEÆ. F. B. I. ii. 874. Himalaya, 2-8,000 ft.	small; smooth, young parts woolly, young plant often spinous, leaves ovate, oblong, acute pointed, of young plants lobed; flowers white, 1½ ins. diam.; fruit 1-2 in. narrowed into the stalk, seeds in a core, flesh of fruit granular, sepals on top of the fruit.
Pyrus Pashia. F. B. I. ii. 874. Himalaya 2,500-8,000 ft. Simla (Collett).	small; young parts woolly, deciduous, barren branchlets end in a spine; in young plants leaves lobed, leaves ovate, flowers 1 in. diam., white and pink, fruit globose, scurfy yellow brown, astringent, eatable in decay, covered with raised white spots, not crowned by sepals.
Pyrus kumaoni, ROSACEÆ. F. B. I. ii. 874. Himalaya, 5-8,000 ft.	like P. Pashia, but differentiated by smooth flower stalks and broad rounded sepals.
Casearia graveolens,	see Shrubs, Alternate, Stipulate, Simple.
Casearia tomentosa,	see Shrubs, Alternate, Stipulate, Simple.

PETALS UNITED.

Randia dumetorum,	see Shrubs, Opposite, Stipulate, Simple.
Euphorbia nivulia,	see Shrubs, Alternate, Stipulate, Simple.
Euphorbia antiquorum,	see Shrubs, Alternate, Stipulate, Simple.

PETALS NONE.

Rhamnus purpureus. RHAMNEÆ. F. B. I. i. 639. Himalaya 4-10,000 ft. Simla (Collett).	small, looks like a cherry tree; young branches purplish with white spots, bark thin, smooth, no spines; leaves 2½-5 in., ovate, lanceolate, thin, minutely toothed, stipules small, soon falling off; flowers greenish in small axillary clusters, calyx cup-shaped, teeth 5, petals none, stamens 5; drupe ¼ in. long, ovoid, seated on the persistent calyx, stone one.

TREES WITH ALTERNATE STIPULATE SIMPLE LEAVES.

PETALS NONE.

Phyllanthus Emblica, *Amla.* EUPHORBIACEÆ. F. B. I. v. 289. The Plains to 4,500 ft. Sutlej Valley (Collett).	small, bark flaking, foliage feathery, light green, leaves deciduous linear sessile ⅓-½ in. close set in two lines along the branchlets like the leaflets of a pinnate leaf, stipules ovate fimbriate ; flowers without petals, yellow set among the leaves on the branchlets, sepals 6, stamens 3 in a column ; fruit ½ in. globose, succulent, green or pale yellow, often reddish, acid, astringent, seeds 6, two in each of the three cells, fruit slightly 6 lobed. The fruit is made into pickle and is used as an astringent medicine.
Phyllanthus distichus, *Chalmeri.* EUPHORBIACEÆ. F. B. I. v. 304. The Plains.	small ; bark roughly grey, deciduous leaves stalked ovate, ⅔ in. in two rows as above ; flowers without petals, $\frac{1}{12}$ in., sepals 4, stamens 4, not in a column ; fruit globose, acid, 3-4 celled, 1 seed in each cell.
Glochidion velutinum, *Amblu.* EUPHORBIACEÆ. F. B. I. v. 322. Himalaya to 5,000 ft. Sutlej Valley (Collett).	small ; young branches downy evergreen, leaves 2-5 in., rounded, stipules rigid ; flowers green yellow, petals none, sepals 5-6, anthers 3 ; fruit ⅓ in. diameter, flattened, 4-6 celled, 8-12 lobed, red.
Antidesma Ghæsembilla, *Umtoa.* EUPHORBIACEÆ. F. B. I. v. 357. Himalaya.	small ; branches, flowers and leaf stalks and under surface of leaves brown and woolly, leaves 2-3 in., base and top rounded ; flowers without petals, small sessile, clustered on spikes, calyx lobes 3-5, stamens 4-7 ; fruit roundish ⅓ in., red to black, edible.
Jatropha Curcas,	see Shrubs, Alternate, Stipulate, Simple.
Ulmus Wallichiana, **Elm.** URTICACEÆ. F. B. I. v. 480. Himalaya 4-10,000 ft.	large, bark rough, peeling in diamond shaped flakes, deciduous leaves 4-8 in., base obliquely, narrowed toothed; flowers appearing before the leaves, in dense lateral racemes, calyx 4-8 lobed, fruit dry flat, winged ⅓-¾ in. (samara).
Holoptelea integrifolia, *Papri.* URTICACEÆ. F. B. I. v. 481. Himalaya to 2,000 ft.	small, deciduous leaves 3-6 in., base unequally rounded, not toothed, flowers in short lateral clusters, apetalous, calyx lobes 5, stamens 8-5; fruit 1 in. long wing tip bifid (samara).

TREES WITH ALTERNATE STIPULATE SIMPLE LEAVES.

PETALS NONE.

Celtis australis, *Kharak.* URTICACEÆ. F. B. I. v. 482. The Plains to 8,000 ft.	large ; leaves deciduous, obliquely ovate, toothed long pointed, flowers pale yellow small, solitary or in clusters, sepals 4-5, stamens 4-5; fruit long stalked ovoid ⅓ in. long, stone wrinkled ; this sweet fruit is supposed to be the Lotus of the ancients.
Trema politoria, *Khagshi.* URTICACEÆ. F. B. I. v. 484. The Plains to 5,000 ft.	large ; roughly hairy, leaves, ¾ in., hard and rough, often long pointed, small toothed, base rounded, leaf stalk short, stipules longer than the leaf stalk, flowers small in small axillary clusters, sepals 4-5, stamens 4-5 ; fruit small, globose, stone pitted.
Plecospermum spinosum.	see Shrubs, Alternate, Stipulate, Simple.
Morus Alba, **Mulberry,** *Tut.* F. B. I. v. 492. The Plains to 11,000 ft.	small ; leaves 2½-4 in., stalk ½-1 in. long, (often lobed), ovate, pointed, toothed, flowers on spikes, sepals 4, stamens 4, fruiting spikes (berries) white or red, sweet, short, ovoid, consisting of fleshy calyces each containing one seed.
Morus indica, *Tutri.* URTICACEÆ. F. B. I. v. 492. Himalaya to 7,000 ft.	small ; deciduous leaves 2½-6 in. with ½-1 in. stalk, ovate (often lobed), sharply toothed, long pointed, rough, flowering and fruiting spike short ovoid, dark purple otherwise like the last species.
Morus serrata, *Karttut, karun.* URTICACEÆ. F. B. I. v. 492. Himalaya, 4-9,000 ft.	small ; leaves deciduous, broad ovate pointed toothed, leaf stalk woolly : fruiting spike short, cylindric, purple, sweet.
Morus laevigata, URTICACEÆ. F. B. I. v. 492. Himalaya to 4,000 ft.	leaves deciduous ovate : fruiting, spike long stalked 2-5 in., long cylindric, white, sweet.

FICUS, JUICE MILKY ; FRUIT A HOLLOW FLESHY VESSEL, IN WHICH FLOWERS AND SEEDS ARE CONTAINED.

Ficus bengalensis, **Banyan,** *Ber, Bargat.* URTICACEÆ. F. B. I. v. 499. The Plains to 4,000 ft.	large, rooting from branches, sometimes epiphytal when young, young shoots velvety ; leaves leathery, ovate to orbicular, edges smooth, nerves prominent, stalk of leaf ½-2 in., not jointed to blade, stipules ¾-1 in., leathery, fruit, round, sessile in pairs red, velvety, size of a small cherry, with 3 broad leathery smooth leaf like bracts at the base.

TREES WITH ALTERNATE STIPULATE SIMPLE LEAVES.

PETALS NONE.

Ficus elastica, URTICACEÆ. F. B. I. v. 508. The Plains.	large: often epiphytic when young, leaves 3-12 in., dark green, much longer than broad, glossy leaf stalk 1-2½ in., not jointed to the blade, stipule single, coloured, almost half as long as the leaf, fruit sessile in pairs ovate, oblong, greenish, yellow, about ½ in. long.
Ficus retusa, URTICACEÆ. F. B. I. v. 511 The Plains.	large; a few aerial roots; leaves 2-4 in., leathery, broadly ovate, leaf stalk ¼-½ in., stipules narrow, ½ in. long; fruit small sessile in pairs, ⅓ in. diam., yellow or reddish, bracts at base, broad ovate.

Leaf Stalk jointed to Blade.

Ficus infectoria, *War, jangli pipli.* URTICACEÆ. F. B. I. v. 515. Salt Range. The Plains.	small: all parts smooth, sometimes sending down a few aerial roots, leaves, shining, on long slender stalks abruptly pointed, stalk 1½-2 in., stipules ½ in. broad ovate, fruit in sessile pairs round, when ripe ¼ in. diam., white tinged with red dotted, basal bracts 3 minute.
Ficus Rumphii, *Pulak, pilkhan.* URTICACEÆ. F. B. I. v. 512. The Plains to 5,000 ft.	often epiphytal, all parts smooth; leaves minutely warty above, broadly ovate, leaf stalk 2½-3½ ins., stipules ovate ½-1 in.; fruit sessile in pairs, globose, smooth, when young whitish with dark spots, when ripe nearly black ½ in. diam., basal bracts 3 round smooth.
Ficus religiosa, *Pipal.* URTICACEÆ. F. B. I. v. 513. The Plains to 5,000 ft. Valley below Simla (Collett).	usually epiphytal, smooth, leaves leathery, shining above, base broad, point long, leaf stalk 3-4 in., slender; fruit sessile in pairs, smooth, depressed, spheroidal dark purple when ripe, ½ in. diam.; basal bracts 3 broad, spreading, leathery.
Ficus clavata,	see Shrubs, Alternate, Stipulate, Simple.

TREES WITH ALTERNATE STIPULATE SIMPLE LEAVES.

PETALS NONE.

Ficus cunia, *Kasea, ghui.* URTICACEÆ. F. B. I. v. 523. Himalaya, 4,000 ft. Valley below Simla (Collett).	small : never epiphytal, leaves unequal sided at base, 6-10 in. long, oblong lanceolate, leathery ; stalk ⅕-⅖ in. ; stipules ¾-1 in., linear fruit in pairs or clusters on scaly usually leafless branches, round or pyriform, hairy, reddish brown when ripe.
Ficus nemoralis. URTICACEÆ. F. B. I. v. 584. Himalaya, 1,500-7,000 ft. Simla below Annandale-Shah. (Collett).	small, not epiphytal : leaves narrow, pointed margin even, stalk ½-1 in., stipules narrow, pointed, smooth, edges rolled up ; fruit, shortly stalked, roundish or club-shaped, ½ in. diam., smooth, reddish when ripe, basal bracts 3 broad, united.
Ficus Roxburghii, *Urbal, timbal.* URTICACEÆ. F. B. I. v. 534. Himalaya to 5,000 ft. Sutlej Valley (Collett).	low, spreading ; leaves broad ovate or rounded, above smooth, beneath somewhat woolly, base heart shaped, 5-15 by 4½-12 in., stalk 1-4 in. ; stipules ½-1 in., ovate pointed ; fruit, top shaped, 2 in. diam., smooth, or velvety, when ripe russet, brown or purplish and spotted ; basal bracts 3, rather large, triangular, fruit stalk ¾-1¼ in., velvety, on leafless branchlets from the trunk in clusters.
Ficus glomerata, *Kathgular, dadhuri.* URTICACEÆ. F. B. I. v. 585. The Plains to 3,000 ft.	large ; bark smooth, reddish brown ; leaves 4-7 in. long ovate, margin even, smooth above, velvety beneath, base round, tapering to the point, stalk 1-2 in., stipules ½-1 in., ovate narrow velvety soon falling off ; fruit 1¼ in. diam., reddish, top depressed, top shaped, stalked in clusters on short leafless scaly branchlets on the trunk and large branches, basal bracts 3 or 4 ovate, small, overlapping.
Villebrunea frutescens,	see Shrubs, Alternate, Stipulate, Simple.
Debregeasia hypoleuca,	see Shrubs, Alternate, Stipulate, Simple.

Flowers minute close set on Hanging or Erect Stalks.

Betula utilis, Birch. CUPULIFERÆ. F. B. I. v. 599. Himalaya, 7-10,000 ft. The Chor, Huttu (Collett).	bark brownish white, inner layer pink, thin with horizontal lentil shaped excrescences, stripping off in thin broad sheets ; leaves, 2-3 in. long, thin light green, when young, pointed ; fruit a one seeded winged lentil like nut.

TREES WITH ALTERNATE STIPULATE SIMPLE LEAVES.

PETALS NONE.

Betula alnoides, **Birch,** CUPULIFERÆ. F. B. I. v. 599. Himalaya, 5-10,000 ft.	bark thicker and excrescences shorter and stripping off in narrower bands than the last species, leaves 3-6 in. long, long pointed ; nut with broader wings than the last.
Alnus nepalensis, **Alder,** CUPULIFERÆ. F. B. I. v. 600. Himalaya, 3-9,000 ft.	bark, compact, silvery grey ; fruit, a woody cone, with a winged nut.
Alnus nitida, CUPULIFERÆ. F. B. I. v. 6000. Himalaya 5-8,000 ft.	bark dark brown, deeply furrowed : fruit, a woody cone, nut with a thickened margin.

Fruit, a Nut (Acorn) seated in a Cup of Hardened Bracts.

Quercus semecarpifolia, Evergreen oak, *Kharshu.* CUPULIFERÆ. F. B. I. v. 601. Himalaya, 6-12,000 ft.	leaves, brown and woolly beneath ; acorn, globose, black, when ripe, enclosed only a third in the cup of overlapping scales.
Quercus dilatata, *Moru.* CUPULIFERÆ. F. B. I. v. 602. Himalaya, 4,500-9,000 ft.	large ; leaves, quite smooth and green ; acorn, ovoid pointed solitary, smooth, brown when ripe ; cup of over-lapping (imbricate) scales covering half the nut.
Quercus Ilex,	see Shrubs, Alternate, Stipulate, Simple.
Quercus incana, *Bana.* CUPULIFERÆ. F. B. I. v. 603. Salt range, Himalaya, 4-8,000 ft. Simla (Collett).	leaves, when young pinkish and woolly all over, when mature dark green and smooth above, white or grey woolly beneath ; acorn ovoid, generally solitary, white and woolly when young, brown and smooth when ripe ; cup of overlapping scales at first almost covering the acorn, afterwards only half.
Quercus glauca, CUPULIFERÆ. F. B. I. v. 604. Himalaya, 3-6,000 ft. Simla (Collett).	large ; leaves, smooth and green ; acorn single or in pairs, ovoid, half buried in a cup of scales arranged in thin velvety rings of scales.

TREES WITH ALTERNATE STIPULATE SIMPLE LEAVES.

PETALS NONE.

Nut, ribbed, contained in Leafy Scales.

Corylus Colurna, Hazel, CUPULIFERÆ. F. B. I. v. 626. Himalaya, 6-10,000 ft. Simla, rare, Narkanda (Collett).	small; bark dark grey, thin, sometimes peeling upwards; leaves, doubly toothed, somewhat lobulater. nut, $\frac{1}{2}$-$\frac{3}{4}$ long, flattened pointed ovoid, hard, deep brown, 2-3 together in a ribbed leathery cup of long scales.
Carpinus viminea, Hornbeam, CUPULIFERÆ. F. B. I. v. 626. Himalaya, East of Chamba, 5-7,000 ft.	branches warted, slender drooping leaves, tips very long, tail-like; nut very small, $\frac{1}{16}$ in. long, ribbed.
Carpinus faginea, CUPULIFERÆ. F. B. I. v. 626. Himalaya, 4-7,000 ft.	bark dark brown, smooth except for some wrinkles, leaves without long tips; nut, $\frac{1}{16}$ in. long ribbed.

Seeds several, each enveloped in a Tuft of White Silky Hairs.

Leaves shortly stalked.

Salix tetrasperma, *Bedleila, bed.* SALICINEÆ. F. B. I. v. 626. The Plains to 4,000 ft. Sutlej Valley (Collett).	small; bark greyish-brown or blackish, rough with deep vertical furrows; leaves 3-6 in. long, four times longer than broad, narrowed at both ends, flowers appear after the leaves on leafy stalks, flower stalks (spikes) 2-5 in. long.
Salix acmophylla, *Bien, bada.* SALICINEÆ. F. B. I. v. 628. The Plains.	medium size, bark reddish brown; leaves 2-5 in. long, five times longer than broad, narrowed at both ends; flowers appear after the leaves on leafy stalks; flowering stalks (spikes) 1-2 in. long.
Salix Wallichiana,	see Shrubs, Alternate, Stipulate, Simple.
Salix alba, White willow, *Bis, changma.* SALICINEÆ. F. B. I. v. 629. Himalaya, Simla, introduced (Collett).	branchlets green, yellow, red or purple, leaves 2-6 in. long, narrow, white with silky hairs beneath, minutely toothed; flowers appear after the leaves on leafy stalks; flowering stalks (spikes) 1-3 in. long.

TREES WITH ALTERNATE STIPULATE SIMPLE LEAVES.

PETALS NONE.

Salix babylonica, Weeping willow, *Beda, majnun,* SALICINEÆ. F. B. I. v. 629. The Plains to 9,000ft.	like S. Alba but with long drooping branches and the leaves not so white beneath as in S. alba.
Salix fragilis, Crack willow, SALICINEÆ. F. B. I. v. 630. Lahoul.	medium size ; branches smooth polished, fragile at their insertion : leaves 3-6 in. long ; flowering after leafing, flowering stalks (spikes) leafy (cultivated only in Lahoul and Western Thibet).
Salix daphnoides, *Beli, shin, thail.* SALICINEÆ. F. B. I. v. 631 Himalaya, 8-15,000 ft. Simla, Mahasu.	bark smooth, greenish grey ; flowers appear before the leaves : flowering stalks (spikes) 1-4 in. long silky.
Salix oxycarpa,	see Shrubs, Alternate, Stipulate, Simple.

Leaves long stalked.

Populus nigra, var. pyramidalis, Lombardy Poplar, *Frast, safeda.* SALICINEÆ. F. B. I. v. 638. The Plains to 10,000 ft. Kashmir, Lahore.	large, sometimes planted, is easily recognised by its pyramidal shape, other characters like the following species of Populus, but leaf 2-4 in., stalk 1-2½ in. long, male flowering spikes short, stamens 15-30, female spikes 4-6 in. long.
Populus ciliata, The Himalayan Poplar, *Pahari pipal.* SALICINEÆ. F. B. I. v. 638. Himalaya, 4-10,000 ft. Simla (Collett).	large bark grey, smooth on young plants, vertically wrinkled on old ; buds viscidly resinous ; branches angled ; leaves 3-7 in. long, ovate, stalk 2-5 in. ; flowering before leafing ; flowering stalks (spikes) male short, female branched, 2-9 in. long ; seeds numerous with long silky hairs.
Populus balsamifera, *Pakh, bút.* SALICINEÆ. F. B. I. v. 638. The Plains to 18,000 ft.	large, strongly scented leaf buds viscidly resinous ; branches angled ; leaves 2-5 in. long, ovate, stalk, 2-5 in. male flowering spikes sessile, stamens 20-30 female 5-6 in. long.

TREES WITH ALTERNATE STIPULATE SIMPLE LEAVES.

PETALS NONE.

Populus euphratica, *Safedar, palach, bagnu* SALICINEÆ. F. B. I. v. 638. The Plains to 13,000 ft.	large ; leaf buds, velvety, not viscid ; branches not angled.
Populus alba, The White Poplar or Abele. *Chita bagnu, jangli frast.* SALICINEÆ. F. B. I. v. 639. Himalaya, 4-10,000 ft. Simla, Planted. (Collett).	large ; leaf buds, shoots and under surface of leaves covered with short dense cottony hairs ; leaves 2-4 in., stalk 1-2 in. ; flowering stalks (spikes) male hairy 2-4 in., stamens 6-10, female spikes shorter.

(*To be continued.*)

INSECT LIFE IN INDIA AND HOW TO STUDY IT,

BEING

A SIMPLE ACCOUNT OF THE MORE IMPORTANT FAMILIES OF INSECTS
WITH EXAMPLES OF THE DAMAGE THEY DO TO CROPS,
TEA, COFFEE AND INDIGO CONCERNS, FRUIT
AND FOREST TREES IN INDIA,

BY

E. P. STEBBING.

Chapter VII (with PLATES III and IV).

(*Continued from page 446 of Vol. XVII.*)

ORDER V. COLEOPTERA (BEETLES)—*contd.*

SERIES II.—*Adephaga* or *Caraboidea.*

Tarsi five jointed, antennæ filiform or nearly so. Mouth parts highly developed, with slender projecting mandibles; abdominal segments visible ventrally usually 5 in number. These beetles are usually dark coloured, active and slim, with long powerful legs which enable them to run very rapidly. Both beetles and their larvæ are carnivorous. The grubs are generally dark coloured, with a group of ocelli on each side of the head and with well developed legs, each having *two* claws. This distinguishes their larvæ from all other coleopterous ones which have only *one* claw present. The grubs live beneath the bark of trees or in wood where they follow and feed upon bark and wood-boring insects; or they are to be found in the soil feeding upon root-eating insects or on or in plants and crops engaged in a similar manner. The group is probably of considerable utility to man.

Fam. IV. Cicindelidæ—Tiger-beetles.

Bright coloured beetles with large eyes and with the clypeus (lower portion of front of the head) extending laterally in front of the insertion of the antennæ, the latter being long and straight. The mandibles are large and are set vertically instead of horizontally, which gives the

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PLATE III.

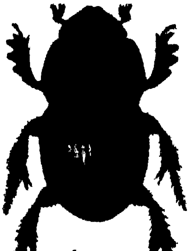


Fig. 2

Onthophagus Igneus

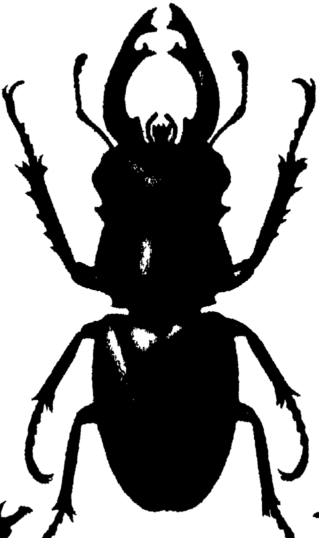


Fig. 1.

Odontolabis Cuvera ♂

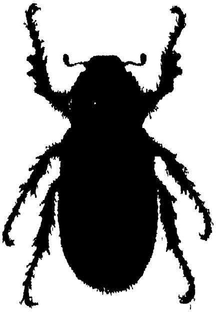


Fig. 3 Lachnosterna serrata

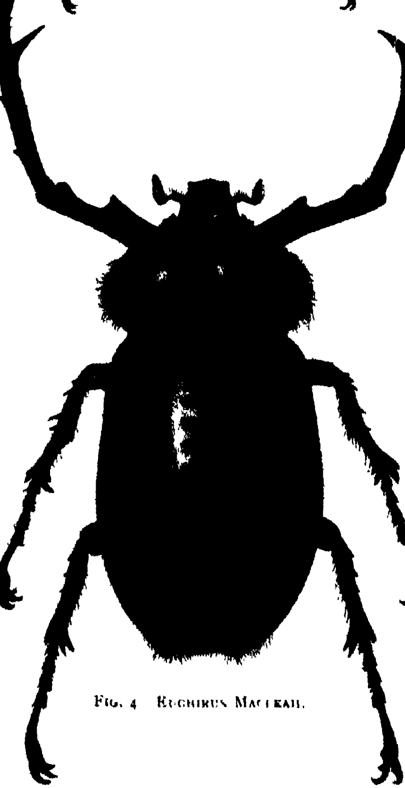


Fig. 4 Euchirus Macleaii.

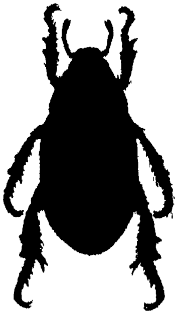


Fig. 5 Mimela Leei.

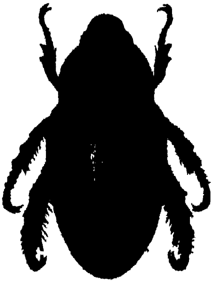


Fig. 6 Popillia cupricollis

head of these insects a striking and curious appearance. The elytra are often brilliantly coloured and spotted, and the legs long and powerful and adapted for rapid movement (*see* Fig. 121).

The Cicindelidæ form one of the smaller families of the Coleoptera, numbering about 1,500 species. Dr. Walter Horn of Berlin is now engaged upon a classification of the family.

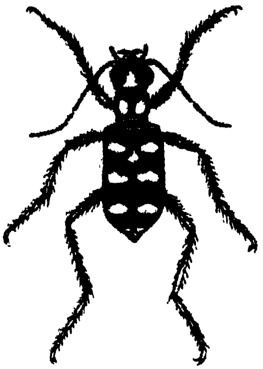


FIG. 121.—The Eight-spotted Tiger-beetle (*Cicindela octonotata*) (Assam).

The beetles move and fly rapidly about in the sunlight and are somewhat difficult to take owing to their wariness and rapid movements. In running they often proceed in a serpentine manner. The family may be said to include some of the most active and the most carnivorous of the beetles. Its members feed upon insects of all kinds. Bates states that the species he observed in South America were of diverse colours, but usually agreed in colour with the general colours of the locale they inhabit. This is not always the case in India : at least not with the common species. For instance the common brightly coloured eight-spotted tiger-beetle is to be found swarming on the stony river banks of the Sunkos River in Assam near the Bhutan frontier and is very easily seen in such a locality. On the other hand numerous forest-dwelling species will be found to resemble to a marvellous degree the many shaded colouring of the forest floor over which they run on flit hurriedly in rapid short flights. The larvæ of earth-living Cicindelidæ live in deep burrows sunk more or less vertically in the soil and probably partially formed by the female, who is furnished with powerful and elongate excavating instruments at the end of her body, at the time of ovipositing. In these pits the larvæ take up a peculiar position for which their shape is particularly adapted : the head and prothorax are broad, the rest of the body slender, the 5th segment of the abdomen is

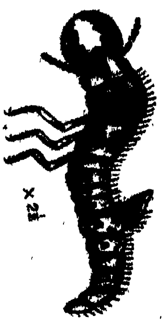


FIG. 122.
Larva of a Tiger-beetle.

furnished on the back with a pair of strong hooks; the larva supports itself at the top of the burrow by means of these hooks and its terminal tube and blocks the mouth of the tunnel with its large head and prothorax and in this position waits for its prey (*vide* Fig. 122). This consists of insects which may alight upon it or run over it. When an insect comes within reach, the head of the larva is thrown back with a rapid jerk, the prey is siezed by the long sharp mandibles, dragged to the bottom of the burrow and devoured. Readers will note that there is some similarity in the method of capturing their prey between the larva of the Ant Lion (*vide supra*) and that of the tiger-beetle. Few Cicindelid larvæ are known but the ones studied all appear to possess the same structure and to have the same habits. Little unfortunately is at present known about them in India.

The greater majority of the Cicindelas are inhabitants of the tropical and semi-tropical regions of the globe and beyond the fact that we are aware that they are predaceous upon other insect life their life histories have been very inadequately studied. Whether they confine themselves to particular forms or species of insect life or whether they are omnivorus in this respect is a point of considerable interest and also of economic utility and one which requires close study. Some members of the family are wingless, whilst others, such as *C. octonotata*, are particularly active on the wing. Some, it is thought, only frequent 'white ant' or termite heaps or nests.

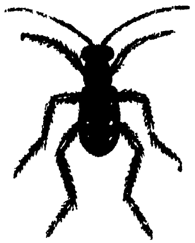


FIG. 123.
The Six-spotted Tiger-beetle (*Cicindela sex-punctata*) (Bengal).

A common Indian species is the little green six-spotted tiger-beetle, *Cicindela punctata*, with green elytra each with 3 orange red spots on them (Fig. 123) which is predaceous upon the rice bug in the rice fields of Bengal where it can be found numerously in the rains. It flies and runs with great activity. *Cicindela octonotuta*, the 8-spotted tiger-beetle (Fig. 121) (brilliant green with red spots), already alluded to is to be found plentiful on the stony river beds of the Sunkos, Reidak and other rivers in Assam near their debouchment from the Bhutan Hills.

C. whithilli is a dark sea-blue species common in Poona (Fig. 124).

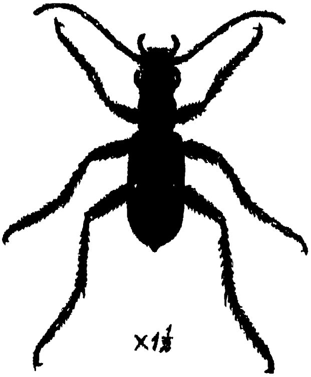


FIG. 124.—*Cicindela whithilli* (Poona).

C. hæmorrhoidalis (Fig. 125) is the black species with two round orange spots on each elytra; it is an inhabitant of Bengal, and other parts of the country, whilst *C. aurulenta*, a Sikkim species, has a green head and thorax with coppery blotches on the latter and cærulean blue elytra with 3 yellow spots on each as shown in Fig. 126.

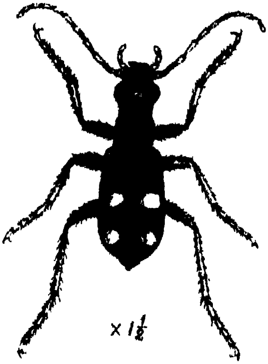


FIG. 125.—*Cicindela hæmorrhoidalis* (Calcutta).

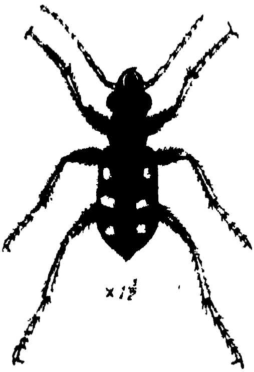


FIG. 126.—*Cicindela aurulenta* (Sikkim).

I have taken this insect often in the Chittagong Hill Tracts and South Lushai Hills where it is common. *Collyris caviceps* has a very long narrow thorax, the whole insect being brilliant shining blue. Another Sikkim species is the curious *Tricondyla macrodera* which is dark shining, blue black in colour and resembles a long black ant. It is shown in Fig. 127.

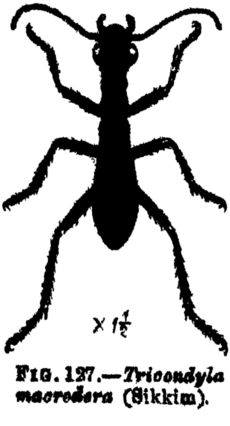


FIG. 127.—*Tricondyla macrodera* (Sikkim).

Fam. V. Carabidæ—Ground Beetles.

These beetles resemble the Cicindelidæ but the mandibles are set horizontally instead of vertically. The insects are usually blue or black in colour and are carnivorous in their habits. The clypeus does not extend laterally in front of the antennæ (Fig. 128); the upper joints of the latter are covered with a minute pubescence.

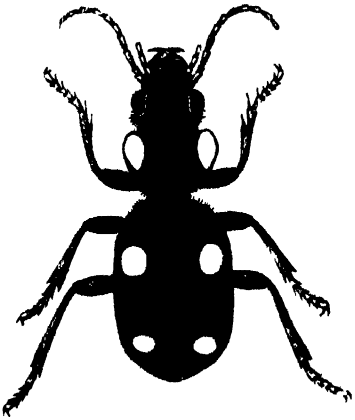


FIG. 128.—The Six-spotted Ground-beetle (*Anthia sexguttata*) (India)

The *Carabidæ* form one of the largest families of the Coleoptera containing over 13,000 described species. The family is of very considerable economic importance to man owing to the carnivorous habits of many of its members. In the tropics and semi-tropics the forms are generally winged, but in other parts of the world they are often entirely terrestrial being rarely seen on the wing, many species having merely rudimentary wings. The larvæ are usually elongate in form and run freely; they can be recognised easily by the fact that their tarsi end in two claws and by their exserted sharp long calliper-like mandibles, and by the body ending in two processes (sometimes jointed) and a tube of varying length projecting backwards. Fig. 129 shows a larva of one of the ground beetles feeding upon a beetle grub.

FIG. 129.—Larva of a Ground-beetle.

The Carabidæ are predaceous both as grubs and beetles, and live in various ways. They attack and feed upon living insects, soft grubs and even dead animal matter. The grubs may live in the soil, the beetle on maturing issuing from the soil and either remaining a terrestrial insect, rarely taking to flight, or it may search for its prey ctively on the wing. The grubs of other species live above

ground running about the surface of the soil or of vegetation or they may live beneath the bark and in wood in the tunnels of bark and wood-boring insects feeding upon the larvæ of these latter. Little is at present known about these bark and wood living forms but it is quite certain that there are a considerable number of species living in the forests in this manner. A few species have been detected eating growing corn and even immature seeds of Umbelliferous plants: these belong chiefly to the genera *Harpalus*, *Zabrus*, and *Amara*. Nothing is known of any Indian forms living in this manner.

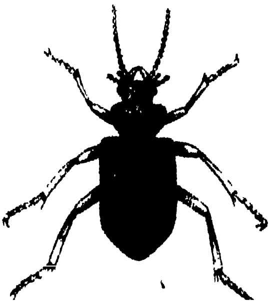


Fig. 130.
Calosome orientale (India).

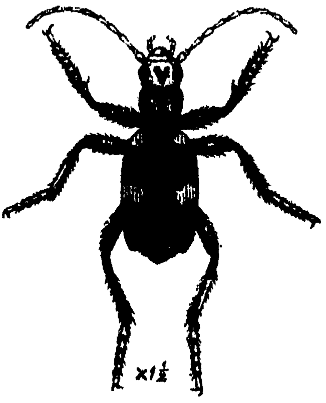


Fig. 131.—*Pheropsophus marginalis* (Calcutta.)

There are a considerable number of blind members of this family; those living in caverns belong to the genus Anophthalmus, species of which have been detected in the caves of the Pyrenees, of Austria and of North America and may not unlikely be found in caves in the Himalayas. Other blind Carabidæ have been discovered in various parts of the world living under large stones buried deep down in the earth, the insects probably passing through many generations under the same stone. Other minute species, of the genus Aëpus, live under stones below high water mark, emerging only when the tide uncovers them. Some Carabidæ frequent the nest of termites and of these there are one or more at present unidentified species in India. Of carnivorous Carabidæ a common small black one in India is *Calasome orientale* (Fig. 130) which attacks and feeds upon the young of the migratory or North-West Locust (*Acridium peregrinum*) destroying them in large numbers when the locust is spreading through the country on its great flights. The large black *Anthia sexguttata*, with six large cream yellow spots on the elytra shown in Fig. 128, is common throughout India. I found it feeding upon the caterpillars of the hawk moth *Pseudosphinx discistriga* in Berar in July 1901. These larvæ were defoliating teak trees in the Melghat forest. Fig. 131 shows *Pheropsophus marginalis*, inhabiting the neighbourhood of Calcutta, which has the elytra widened apically, the head and thorax with yellow blotches on them and each elytra with two yellow patches on them, the largest behind. A closely allied species with a red head and thorax and dark blue-black elytra with 3 yellow blotches on each, the basal small, median ones large and rounded and apical ones transverse, is common in the N. W. Himalayas and in the Terai region at the foot of the mountains.

Catascopus whithilli, shown in Fig. 132, is a Carabid beetle fairly common in Sikkim. I have also taken it in Assam. The head and thorax are shining green, the latter having a V-shaped depression situated centrally; the elytra are purple black and channelled. Fig. 133 depicts a common black ground beetle of Bengal named *Trigonotoma viridicollis*. This insect has a metallic green thorax.

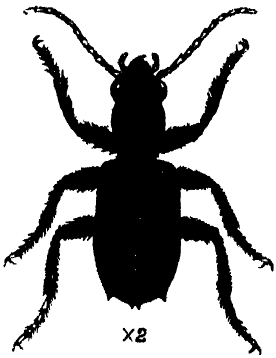


FIG. 132.—*Catascopus whithilli* (Sikkim and Assam).

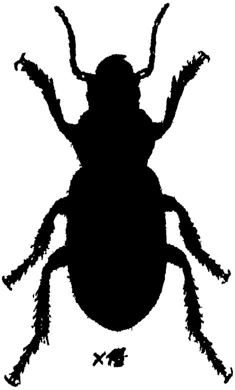


FIG. 133.—Common black ground beetle (*Trigonotoma viridicollis*) (Maldah.)

The most curious insects of the group are, however, the 3 known species of the genus *Mormolyce* which as Fig. 134 shows have some resemblance to the remarkable leaf-insect (*Phyllium scythe*) shown in Fig. 14 of these papers. The *Mormolyce* have an extraordinary shape for *Carabidæ*; the sides of the elytra form large crinkled expansions and the head is unusually elongate. These insects live on the underside of fallen trees in the Malay Archipelago and Peninsula and in Tenasserim. It is possible that their flat shape may aid them in their pursuit of their insect prey as is known to be the case with other forms of insect life predaceous upon bark and wood-boring insects. *Mormolyce phyllodes*, the insect depicted in Fig. 134, comes from Tavoy.

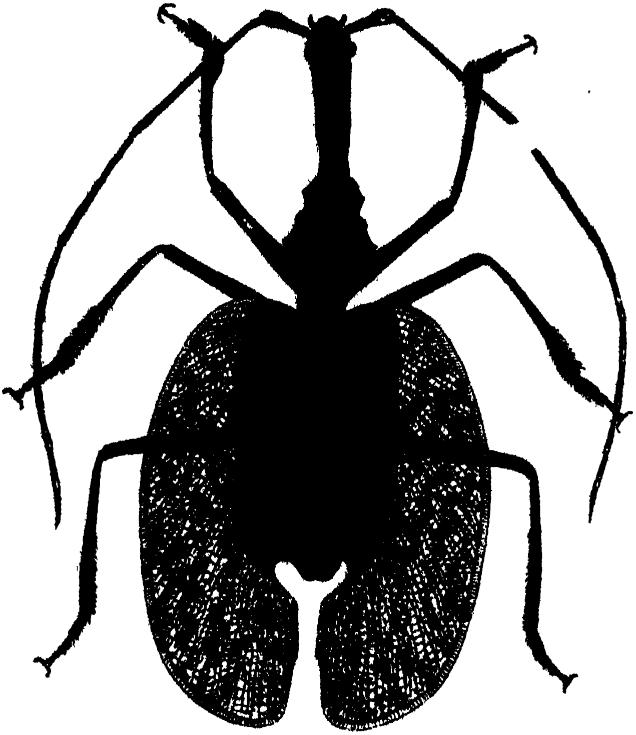


FIG. 134.—*Mormolyce phyllodes* (Tavoy).

Fam. VI. Dytiscidæ—Water-beetles.

This is the only aquatic family of beetles which will be briefly considered in these papers.

The Dytiscidæ have their antennæ bare ; the hind legs are formed for swimming and cannot be used for ordinary walking ; the metasternum has no transverse line across it and is closely united behind with the extremely long coxæ.

The Dytiscidæ or true water-beetles are of interest because they differ from the aquatic Neuroptera, in that they live in water both in the larvæ and imaginal stages of their lives; there is reason nevertheless for believing that they are modified terrestrial insects. In their general organisation they are similar to *Carabidæ*. They are perfectly at home in water but they must come to the surface to breathe. The wing cases fit perfectly to the body, except at the tip, so as to form an air-tight space between themselves and the dorsal surface of the body: this space forms an air reservoir. When the insect requires more air it rises to the surface and exposes the tip of the body exactly at the level of the water, separating at the same time the abdomen from the wing cases so as to open a broad chink at the spot where the parts were, during this insect's immersion, so well held together as to be air and water-tight.

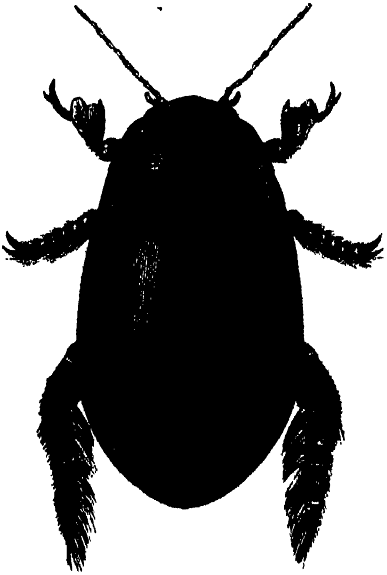


Fig. 134.—A predaceous water-beetle (*Cybister limbata*) (Bengal).

Something over 1,800 species are at present known, the insect being most plentiful in the cooler regions of the globe. *Cybister limbata* (*see* Fig. 135) is a predaceous water-beetle which has been described by Annandale from Behrampur in Bengal.

INSECT LIFE IN INDIA.

Correction Slip.

As it was found impossible to place all the beetles depicted in the coloured Plates III and IV on one Plate, the following corrections are necessary in the text of Chapter VII:—

Vol. XVII. No. 2.—p. 437—lines 28, 29—delete the words "It is depicted in Plate III, fig. 3."

p. 439—line 4, for 'Plate III, fig. 4' read 'Plate III, fig. 3.'

p. 441—last line, for 'Plate III, fig. 5' read 'Plate III, fig. 4.'

Vol. XVII. No. 2.—p. 443—line 3, for 'Plate III, fig. 6' read 'Plate III, fig. 5.'

p. 443—line 4, for '*Popilea cupricollis*' read '*Popillia cupricollis.*'

p. 443—line 6, for 'fig. 7' read 'fig. 6.'

p. 444.—line 35, for 'Plate III, fig. 2' read 'Plate IV, fig. 1.'

p. 445.—line 38, for 'Plate III, fig. 8' read 'Plate IV, fig. 2.'

p. 446.—line 2, for 'Plate III, fig. 9' read 'Plate IV, fig. 3.'

p. 446.—lines 10, 11 for 'fig. 10 in Plate III' read 'fig. 4 in Plate IV.'

(*To be continued.*)

THE PRESENT EPIDEMIC OF MALARIA IN THE PORT OF BOMBAY: A DESCRIPTION OF THE MOSQUITO WHICH IS CARRYING THE DISEASE, WITH SOME REMARKS ON PREVENTIVE MEASURES.

BY

CAPT. W. GLEN LISTON, I. M. S.

(*With 4 Illustrations.*)

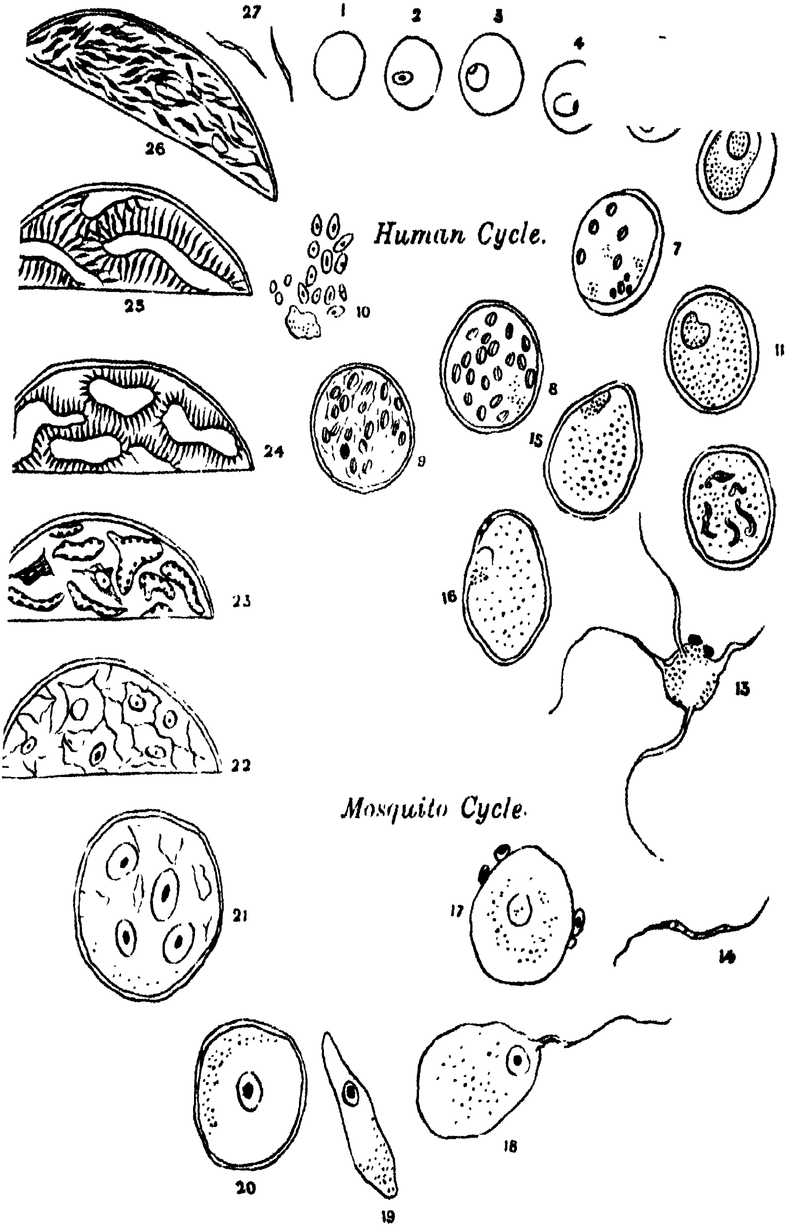
(*Read before the Bombay Natural History Society on 24th September* 1908.)

In a paper which I read before this Society in 1905, entitled: 'Plague Rats and Fleas,' I put forward reasons why a subject like this, which, at first sight, appeared to be a medical one, should be considered by a Natural History Society. To-day, in asking you to bear with me while I tell you something about malaria, similar reasons have prompted me to claim your indulgence. The reasons are briefly these: Malaria, as I will show you, is as closely connected with Natural History as it is with medicine, for while quinine can generally cure the disease it is nevertheless more important to prevent the spread of the malady than to attempt to cure it, and this can only be done by those who have some knowledge of Natural History.

Malaria is one of the most potent causes of sickness and death in tropical lands; it has been the greatest hindrance to the civilization of these lands: it has cost the British Empire, in the attempt to accomplish this noble object, millions in men and money. The cause of this loss, since the cure is now in our hands, is much to be deplored and must be attributed, at least in great measure, to ignorance of the cause and prevention of the disease. This subject, therefore, is well worthy of consideration not only by the medical profession but by the whole human race. It is a study which, when the lessons it teaches have been applied, will be of the greatest benefit to man. Briefly, it may be said that the cause and prevention of malaria resolves itself into a study of the malaria parasite in man and mosquito, such a study necessarily involves a knowledge of the haunts and habits of mosquitoes, particularly those species of them which are responsible for the communication of the disease from man to man. You will thus understand that it is a subject well worthy of consideration by this Society.

Malaria is a very ancient disease. It was well-known even at the time of the Roman Empire, but it was not carefully differentiated from other fevers till the discovery of Cinchona bark in the beginning of the 17th century. The fevers which were found to yield to treatment with this drug were thus more definitely distinguished from other fevers and were found to possess peculiar features of their own. The fact that quinine destroyed the poison of this malady led to the assumption that the poison, which produced the disease, must be of a specific kind. Many wild guesses were made as to its nature. On the one hand, it was thought to be a gas, evolved, it might be, from decomposing vegetable matter: on the other hand, it was held to be a parasite. Various fungi and bacteria were from time to time believed to be the cause of the disease, among the most famous of these was the *bacillus malariæ* of the Italian School. Meanwhile, however, a more minute scientific study of the disease showed that it was associated with the appearance of a black or brown pigment in the blood and organs of the sick. How came this pigment to be produced was the question next to be solved. It remained for Laveran to show that the pigment was formed in the bodies of minute animal parasites (quite distinct from bacteria) which infested the red blood cells of persons afflicted with the disease.

The life history of this parasite in man was soon worked out and at least three varieties of the parasite were recognised. Then arose the question: How could the parasite gain an entrance into the blood of the sick, and how could it escape from the sick to infect other persons? A minute study of the various forms of the parasite as it appeared in the blood of man showed that in each particular variety of parasite two series of forms could be differentiated. One series of forms appeared to be associated with an asexual process of multiplication within the body of man, while another series of forms appeared to be differentiated into males and females. Further, it was observed, that after the parasites had been removed from the body of man together with the blood, the male and female forms conjugated. Here evidently was a clue to the continuance of the life of the parasite outside the body of man. But it was still an open question in what situation further development took place. The fact that conjugation occurred after the blood was drawn from the sick suggested the idea that the parasite might find an alternate host in the body of some blood-sucking insect. The observation that the disease was most frequently found in marshy places and in latitudes where mosquitoes were prevalent pointed to this insect as the most probable host of the parasite. While this was a theory accepted by many, even before Ross' brilliant and painstaking work converted the theory into a fact, few have yet fully appreciated the significance of his work. The fact cannot be too clearly impressed upon you that it is not every mosquito which is capable of spreading the disease. Had this been the case, Ross' task would have been a comparatively easy one, but he had to find *the mosquito* which alone among hundreds of others was capable of harbouring the parasite. Hundreds upon hundreds of mosquitoes were carefully examined by him without success, till one lucky day he observed a new kind of mosquito with "dappled" wings. Success attended this discovery, for in this mosquito with spotted wings the human malaria parasite developed. I well remember, as I was coming out to India for the first time, reading on board ship with great fascination Ross' new discovery. I then realised the importance of knowing something about mosquitoes, but you will be surprised to learn that some years elapsed before I was able to acquire even the most elementary knowledge of these insects despite the fact that I made every effort to obtain literature on the subject. Indeed, at that time, so little was known about mosquitoes, that one had to learn about these insects by studying them for oneself. While I was stationed on military duty at Ellichpur a splendid opportunity presented itself for working at mosquitoes, especially that family of them which is associated with human malaria—I mean those mosquitoes which are generally known as Anopheles. At Ellichpur, among a number of other anopheles which I found there, I was able to recognise five new species, one of these is the mosquito which is responsible for spreading the epidemic which at present afflicts thi Port and about which I propose to tell you more to-day. But before I can pass on to this part of the subject, I must detain you for a minute while I describe, as briefly as I can, the various stages



LIFE CYCLE OF THE MALARIA PARASITE.

through which the malaria parasite passes in the course of its development.

The malaria parasite occupies a very humble position in the animal kingdom, being classed among the Protozoa. Let me introduce you to this creature as you will find it in the blood of a patient suffering from the disease, just at the commencement of an attack of fever. The parasite then appears, after suitable preparation, as a minute ring living within the substance of a red blood cell* (Fig. 2). Hour by hour it grows in size converting the red colouring matter of the red blood cell into a black pigment till the whole of the substance of the cell is destroyed and the parasite has reached maturity (Figs. 3 to 6). This may occupy a period of from 48 to 72 hours. The parasite then divides into a number of segments, spores, or seeds which, separating from one another, attack and enter fresh red blood cells to repeat in them a similar cycle of development (Figs. 7 to 10). A time, however, soon comes in the course of the disease, when certain individuals are developed which, as they grow larger, in place of dividing into a number of spores, become differentiated into male (Figs. 11, 12) and female (Figs. 15, 16) elements. These latter forms of the parasite remain in the blood awaiting a favourable opportunity to be transferred to the body of a mosquito when that insect comes to suck the blood of our patient. If by good luck this mosquito happen to be a particular kind of anopheles and if it has had a good feed on the patient's blood the male and female parasites, which have been taken into the mosquito's stomach with the blood, conjugate there (Figs. 13, 14 and 17, 18), producing by their union a minute motile worm-like body (Fig. 19), which immediately proceeds to pierce the stomach wall of the mosquito. Having entered the stomach wall of the mosquito the parasite comes to rest surrounding itself with a capsule among the cells of that organ (Fig. 20). Here it gradually increases in size and by a process of multiple division produces a vast number of very minute spindle shape forms within its capsule (Figs. 20 to 26). When mature these spindle forms escape into the body cavity of the mosquito and make their way to the salivary or poison glands of the insect. In these glands they find lodgment, particularly in the gland secretion, and are now ready, when the mosquito thus infected bites man, to be injected beneath his skin together with the insects stinging secretion. These spindle forms (Fig. 27) placed beneath the human skin seek out the red blood cells (Fig. 1), attack and enter them reproducing in them those stages of development which I have already described to you (Figs. 2 to 10).

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* The reader should follow the development of the parasite in the diagram (Plate A).

The malaria parasite thus passes through two very distinct periods of development which we can separate by a line in the diagram I have made. One period is passed in the body of man, while the other is passed in the body of a suitable mosquito. For the maintenance of its existence the parasite must pass through each of these stages successively. Certain conditions are required on the one hand for the transference of the parasite from man to mosquito, while on the other hand certain other conditions are necessary for its transference from mosquito to man. The most important conditions necessary in the former case are: first, the presence of definite species of anopheles, and second, the presence of suitably infected man, *i.e.*, with male and female forms of the parasite in the circulating blood. In the latter case the necessary conditions are first, the presence of suitably infected anopheles, *i.e.*, with the spindle shaped bodies (sporozoites) in the salivary secretion, and second, the presence of susceptible man. With these somewhat long, though necessary, preliminary remarks we are now in a position to consider the immediate subject of this paper—the present epidemic of Malaria in the Port of Bombay.

My attention was first directed to this epidemic by certain remarks made in the Municipal Corporation by Mr. D. E. Watcha and Dr. Sukhia. These gentlemen a few months ago declared that so severe was the epidemic of Malaria in the Frere Road and in certain parts of the Fort that the houses there were being vacated and people were leaving the place. These statements so excited my curiosity that I determined to make an enquiry into the matter. Investigation proved that the statements were correct and that a very severe epidemic of Malaria was raging in these districts, as the following facts will show you.

There are four ways by which it is possible to ascertain to what extent Malaria is present in a particular place. We may firstly scrutinise the vital statistics or secondly we may examine the children of the place, observing to what extent enlargement of the spleen is present among them. Thirdly we can examine microscopically the blood of the children living in the locality and note the number which harbour malaria parasites. Fourthly, we can seek for anopheles in the district noting the species and especially the number which show malaria parasites in their bodies.

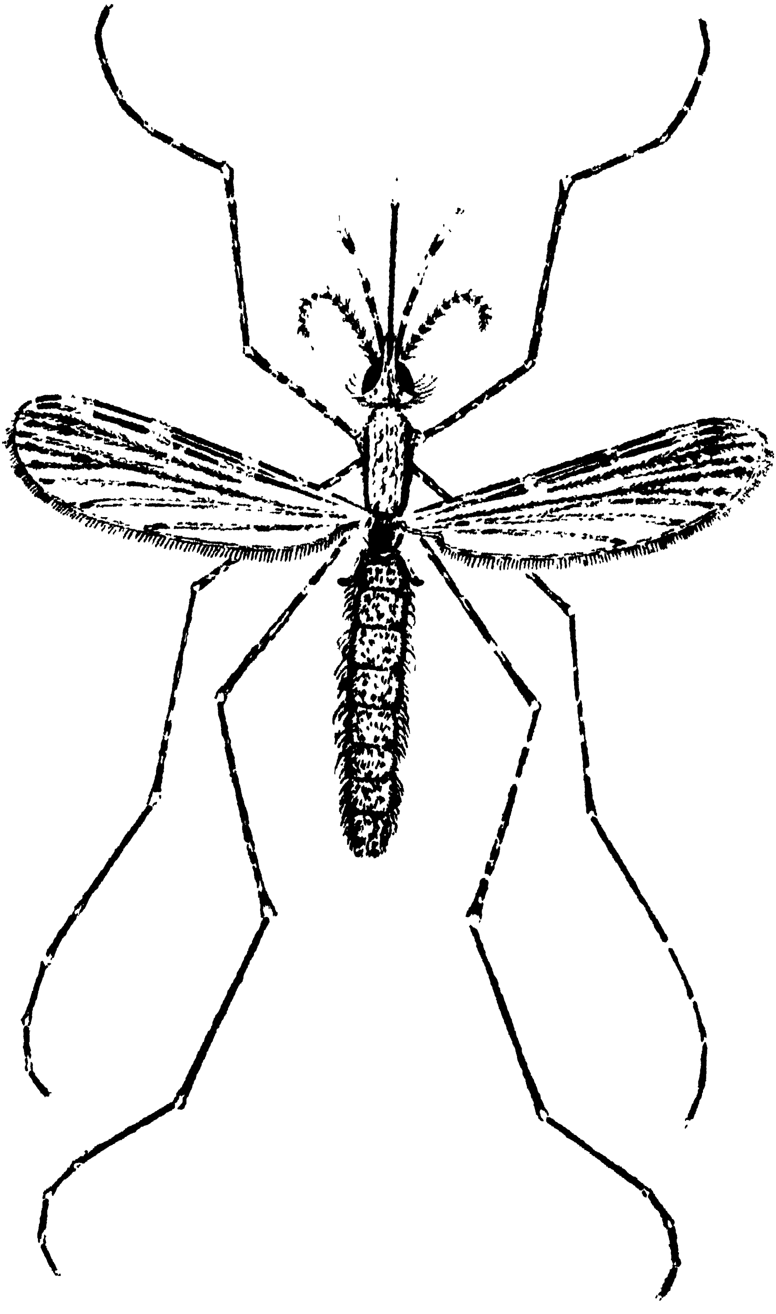
With the assistance of Captain Mackie I have been able to gauge the severity of the disease in the present instance in each of these four ways, and I shall deal with each method separately.

It was difficult to obtain reliable statistics of the extent to which malaria prevailed for accurate records had not been kept in the past. Many cases of the disease however came to our notice and I may mention particularly three cases of that grave and fatal form of the malady known as cerebral malaria. These cases all occurred within a period of three weeks. But I am in a position to give some figures which carry with them some force, they have been kindly supplied to me by the Superintendent of the P. & O. Company. He writes: "Each steamer after " being in the Victoria or Prince's Docks for a few days returns its " cases of malaria with painful regularity and not only does the " sickness last the whole time the ships are in port here but the " fever appears to be of such a malignant character that it continues " throughout the whole voyage to London and consequently in-" capacitates a large number of our crews from rejoining thei· " vessels there. This state of things has become so serious that " my General Managers have telegraphed to me from London that " cases of malaria are increasing to an appalling extent amongst the " crews of the Bombay mail steamers, the 'Arabia' which sailed from " Bombay on the 1st August last having had 82 cases on the " homeward voyage, the 'Persia' which sailed on the 15th " idem landed 100 cases in London and a similar number occurred " on the 'Marmora' which left on the 29th August. This will give " you some idea of the seriousness of the epidemic."

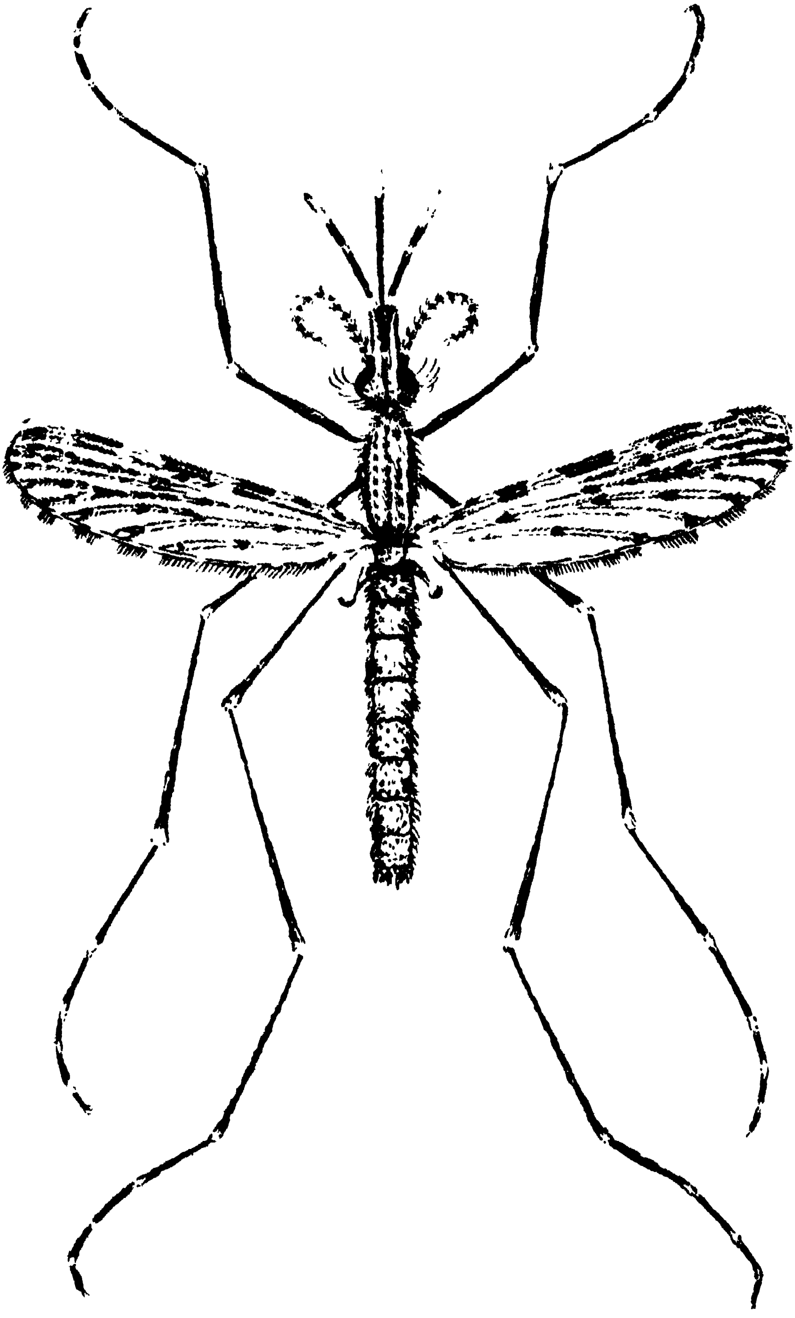
Secondly, we have examined a considerable number of the children living in the Frere Road in order to ascertain to what extent enlargement of the spleen prevailed among them. No less them 80 per cent. of the children suffered in this way. Thirdly, a microscopical examination of the blood of a number of children was made, which revealed the fact that as many as 50 per cent. of them were harbouring the malaria parasite.

Fourthly, we collected a number of mosquitoes in the neighbourhood; we observed that anopheles were abundantly present. An examination of these showed that two species were found, *viz.*, *Anopheles rossii* and *Anopheles stephensi.* Now the former mosquito can be captured all over Bombay; moreover it has been examined in large numbers on many occasions, but has never been observed to be infected in nature, so that this mosquito did not seem to play any part in spreading the disease. *Anopheles stephensi* on the other hand has never been found by me in Bombay before. It has since been captured only within the limits of the present epidemic area. We have dissected a large number of these mosquitoes, caught chiefly in the Frere Road; nearly 25 per cent. of them harboured the malaria parasite in some stage of development. This discovery is particularly interesting, not only because it is the first time that this mosquito has been observed to be infected in nature, but also because the other species which have been found infected in India, *viz.*, *Anopheles listoni* and *Anopheles culicefacies* have been mosquitoes which breed in flowing water—in streamlets and irrigation canals, while this mosquito, *Anopheles stephensi*, generally breeds in still water—in wells, in cisterns, in chatties and in tinpots. Moreover, it assumes an additional interest in view of the fact that the present epidemic seems to be associated in some way with the construction of the New Docks. Earthworks of this nature have very often been associated with severe malaria, and if for no other reason than to guard against such eventualities in the future, the present epidemic ought to be thoroughly investigated.

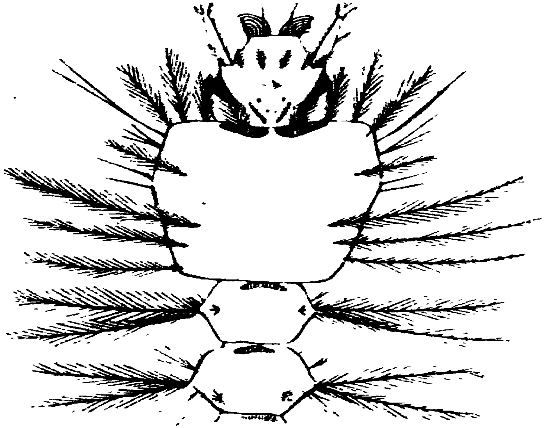
I have said that this epidemic of Malaria is associated with the presence of two species of anopheles, the one harmless, while the other is responsible for spreading the disease. It is of importance, therefore, to distinguish these mosquitoes from one another. They can be differentiated from one another in the stages of *imago*, *larva*, and *egg*. The fully-developed mosquitoes, as you will see, somewhat closely resemble one another (Plates B and C); but a more careful inspection will reveal the fact that *Anopheles stephensi* is rather greyer than *Anopheles rossii* which has a somewhat brownish hue. With the naked eye or a hand lens you can readily observe that the marking on the palpi of the two mosquitoes differs. *Anopheles stephensi* has two broad white bands towards the tips of the palpi separated by a narrow



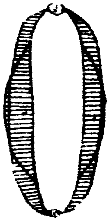
ANOPHELES STEPHENSI.



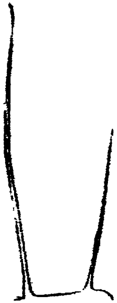
ANOPHELES ROSSI.



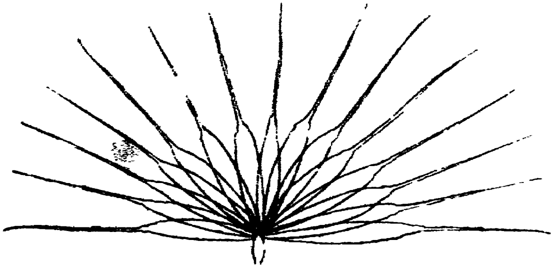
Head and Thorax.



Egg.

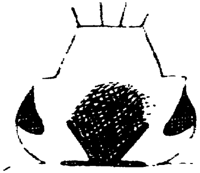


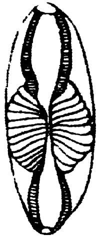
Frontal Hairs.

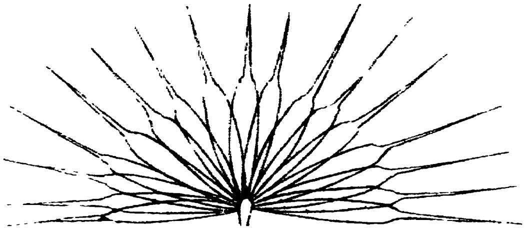


Palmate Hair.

[illegible]VA AND EGG OF A. ROSSI.







Pa m

Hairs.

LARVA AND EGG OF STEPHENSI

dark band (see Plate B), while *rossii* has a single broad white band at the tips of the palpi followed by a broad dark band which again is followed by a narrow light band (see Plate C). The legs of *Anopheles stephensi* too are speckled, especially the tibia and femora, while this is not the case with *Anopheles rossii* (see Plates B & C). The larvæ can be distinguished by the shape of the leaflets of the palmate hairs, the terminal filament of each leaflet in *rossi* is very long (see Plate D), while it is comparatively short in the case of *stephensi* (see Plate D). The eggs of the two species differ. In the case of *stephensi* the lateral floats encroach upon the deck surface of the egg, so that this surface has the shape of a figure of 8 (Plate D). The floats in the egg of *rossii* are placed well down upon the lateral surfaces (Plate D).

Let us now see whether the favourable conditions necessary for the multiplication of the malaria parasite are to be found in the infected area. First the conditions suitable for the transference of the parasite from man to mosquito are fulfilled in the abundant presence of a suitable species of anopheles, *viz.*, *Anopheles stephensi* and in the presence of a human population suitably infected with parasites working on the new docks, many of whom, especially "the ghatis," coming from malaria-infected country villages, carry in their blood the parasite ready to develop in mosquitoes. Secondly, the conditions for the transference of the parasite from mosquito to man are fulfilled in finding a large number of suitably infected mosquitoes among the susceptible population of the Port. These are conditions suitable for the epidemic spread of the disease.

I have left myself little time to speak about preventive measures. These measures can conveniently be considered as personal and public measures. A word or two on personal measures will suffice. The object of these measures is twofold. First to destroy the malaria parasite in the human body by the administration of quinine: second, to avoid being bitten by mosquitoes by the use of mosquito curtains at night and protective coverings for the feet and hands during the evening hours. The use of Wellington boots in the evening, in place of slippers, is a very simple and effective precaution against infection.

Public measures for the prevention of malaria are more important in this country, because poverty and ignorance seldom permit the personal measures being properly carried out. These measures aim chiefly at the extermination of the malaria carrying mosquito, and this is generally effected by destroying the insect in its larval stage when it is found living in various collections of water. A gang of men is organised and trained to detect and destroy these mosquito-breeding places. Major Ross has given the name 'Mosquito Brigades' to these gangs. The work undertaken by a mosquito brigade can be done intelligently or otherwise. On the one hand, having ascertained which particular mosquito is spreading the disease, they can seek out and remove the breeding places of this mosquito, or, on the other hand, they may blindly attempt to destroy all mosquito-breeding places. This latter is the plan of working generally adopted. To my mind, in a city like this, such a plan of operations is not only foolish but likely to yield very unsatisfactory results. A knowledge of the habits of mosquitoes soon teaches us that each species selects particular types of breeding places, so that it is possible to say, for example, that in this puddle we shall find *Anopheles rossii;* in this irrigation canal we shall find *Anopheles culicifacies;* in this tank we shall find *barbirostris*, or it may be *fuliginosus*. We can, in this way, seek out any particular species of mosquito we may want and naturally save ourselves an immense amount of trouble. If we mean to exterminate any particular species of mosquito it is blind folly to attempt to destroy all mosquitoes, for not only will the task be a herculean one, but the expenditure both in time and money will be enormous. It is necessary, therefore, having first ascertained which mosquito is carrying malaria to seek out and destroy its breeding places. In the present case we know that *Anopheles stephensi* is the mosquito which is spreading the disease and it is important to learn something about its breeding places.

In Bombay I have found this mosquito breeding in iron cisterns on the roofs of the houses and in concrete water troughs. In Madras it has been found in old disused wells, and in the Punjab in earthenware gharras of water and in tin pots containing clean water. In short, *Anopheles stephensi* is a mosquito which breeds in small collections of clear water. Having discovered the breeding places, each one will require to be dealt with rationally. It is absurd to paint kerosine or postorine over every pool. Thus, for example, to prevent *Anopheles stephensi* breeding in the iron cisterns in our houses in the Fort, the hinged trap-door, now generally used on these cisterns, must be replaced by a more accurately fitting cover to prevent mosquitoes gaining an entrance to the water. Again the best treatment for disused wells is to have them filled up.

Dealing with the breeding places of *stephensi* in this rational way we can appreciate what effect our measures are having by collecting the adult insects from time to time and observing whether they are more or less easily found. If still they continue to be easily captured, then we must seek some other, yet undiscovered, breeding place.

In bringing this paper to a close and thanking you for your patient hearing, I feel sure that you will agree with me that the time has arrived when a thorough enquiry should be made into the conditions which have brought about this epidemic, and that measures should be at once taken to deal with the situation in some more thorough way than has been attempted in the past.

AN INDIAN STOAT.

BY

R. C. WROUGHTON, F. Z. S.

Blanford records that a stoat taken by Dr. G. Henderson at Dras, beyond the Koji La, is in the Indian Museum, Calcutta. This is, I believe, the only authenticated case, a stoat having been *taken in India*, and even this scarcely comes strictly under that category.

Mr. C. H. T. Whitehead has recently presented to the National Collection a small collection of mammals, among which are three specimens of a stoat (1 ♂ and 2 ♀), which, by their size, are evidently of a different species from *M. erminea* of Europe. I have much pleasure in naming this new species after Mr. Whitehead.

MUSTELA WHITEHEADI, sp. n.

A *mustela* of the *erminea* type but of markedly smaller size.

Fur and colour pattern as in *M. erminea.*

Dimensions of the type taken in the flesh (the figures in brackets are those of an adult female of the same species) :—

Head and body, 210 (173) ; tail, 85 (68) ; hindfoot, 37 (28) : ear, 21 (16).

Skull : greatest length, 43 (37) ; basilar length, 38·7 (32·1) ; zygomatic breadth, 23 (19·6) ; braincase breadth, 20·5 (17) ; length $\underline{\text{p.4.}}$ 4·9 (4) ; length $\underline{\text{m.1}}$ 3·6 (3·1).

Hab.: Hazara Dist.. N. W. Frontier Province (Type from Kagan Valley).

Type : Adult male. No. 49.. Collected by Mr. C. H. T. Whitehead on 24th July 1908 and presented to the Natural History Museum, South Kensington.

In 1895, Mr. Thomas (Ann. Mag. N. H., p. 452) described a form still smaller than *whiteheadi*, from Ferghana, which he temporarily classed as a sub-species of *M. erminea*, the typical European stoat. This latter species has been broken up into quite a number of geographical races, the differences between these however are very small compared with the gap which separates all of them from the present form and, *a fortiori*, from *ferghanæ.*

Accepting *ferghanæ* as a good species, and ignoring the local races of *erminea*, the following table gives the comparative sizes of *M. erminea* (represented by English specimens), *M. whiteheadi*, and *M. ferghanæ*.

Dimensions.	M. erminea.		M. whiteheadi.		M. ferghanæ.	Remarks.
	♂	♀	♂	♀	♂	
Head and body ...	270	220	210	178	200 *	* This measure was taken from a skin specimen and is almost certainly excessive.
Tail	115	105	85	63	63	
Hindfoot	45	40	37	28	31	
Ear	22	22	21	16	...	
Skull: greatest length ...	52	46·3	43	37	35·4	
basilar length .	48	42	38·7	32·1	29·7	
zygomatic breadth	30	26	23	19·6	18·2	
braincase breadth	22	20·4	20·5	17	17·8	
length $\underline{\text{p.}^{4}}$ ...	5·1	4·6	4·9	4	4·1	
length $\underline{\text{m. 1}}$ ...	4·9		3·6	3·1	3·3	

FURTHER NOTES ON THE BUTTERFLIES OF THE KONKAN.

BY

G. W. V. deRhé-Philipe.

In an earlier number of the Journal (Vol. XV., page 42), Messrs. Comber and Aitken published a list of the Butterflies of the Konkan : and the former added a few further notes in a later number of the same Volume (page 356). May I supplement these and add a few more species to the lists—the result of a couple of years' somewhat occasional collecting in the areas in question.

Euplœa kollari, Felder.—This species is far more common—on the Ghats at any rate—than is generally thought. Its similarity to *E. core*, especially during flight, is however so great, that it escapes notice as a rule. It certainly escaped mine for two years ; but netting a somewhat larger and heavier looking *Euplœa* than usual for examination on one occasion, I found it to be a '*kollari*'; and thereafter I took several at Khandala in October and November last year. There was one particular corner just below the Khandala Hotel camping ground where they fairly swarmed.

Ypthima baldus, Fabricius (= *Y. philomela*, Johanssen).—Common on the Ghats in October and November ; less so during the rains.

Ypthima asterope, Klug.—This species does not appear in Mr. Comber's lists A female was taken at Andheri in October.

Apatura camiba, Moore.—Common at Khandala after the rains. It particularly affects the flowers of the *Lantana*.

Byblia ilithyia, Drury.—May occasionally be taken on the Ghats but is not very common.

Ergolis ariadne, Linnæus.—One specimen taken at Khandala in June.

Ergolis taprobana, Westwood.—This is a race or form of *E. merione*, Cramer, not of *E. ariadne* as is implied in the list published. It is the common form on the Ghats and quite replaces '*merione*' the usual form.

Libythea myrrha, Godart, variety *rama*, Moore.—Not in Mr. Comber's list. Is decidedly rare. One taken near Khandala in October 1907.

Papilio helenus, Linnæus, or rather the local race *P. daksha*, Hampson.—Comparatively common on the Ghats during and after the rains. Have also seen more than one at Vehar.

Papilio polytes, Linnæus.—I have to record a fourth type of female intermediate between the '*romulus*' and '*polytes*' types. It has the discal markings on the hind wing *white* as in the '*polytes*' form, but at the same time approaches the '*romulus*' type in having the broad white band on the forewing. The specimen, which was taken at Khandala in October 1905, is the only one of the kind I have seen.

Papilio teredon, Felder.—Col. Bingham separates this as the local western and southern form of *P. sarpedon*, Linnæus. The differences noted by him are unmistakeable; and, judging by the fairly long series of both forms that I have examined, are absolutely constant.

Huphina remba, Moore.—I cannot understand this—the local race of *H. nadina*, Lucas—not appearing in Mr. Comber's lists. The species is almost as common on the Ghats as *H. phryne;* and the difference between them is abundantly distinct even during flight. Females are very rarely taken.

Ixias nola, Swinhoe.—According to Col. Bingham, this variety is confined to Mahableshwar, but I took an unmistakeable specimen at Khandala in October last year. In addition to the differences between this species and *I. mariamne* given by Col. Bingham (*Fauna of India-Butterflies*, Vol. II, page 197), the following are noticeable:—

> Termen of forewing of *I. nola* slightly but appreciably concave. Upper side, ground colour a light creamy white, not the chalk white of *I. mariamne.* The blue black shading at the base of the wings, so noticeable in nearly all specimens of '*mariamne*' is very much restricted; and the terminal black border ceases at vein 1 in '*nola*' whereas in '*mariamne*' it always extends right up to the posterior angle, and in many cases partly up the dorsal margin. The black edging on the inside of the orange apical patch on the forewing sub-obsolete below the sub-costal vein, an intensely black spot partly covering the discocellulars. Underside, a much lighter yellow than in '*mariamne*,' especially on the apical area of the forewing, which in the latter has always a reddish tinge owing to the orange of the upperside showing through, but which in '*nola*' is pure light yellow.

The above gives the insect a noticeably distinct *facies* from all specimens of '*mariamne*' I have seen; while, of course, it is altogether different from any of the various forms of *I. pyrene.* I have not seen Swinhoe's original description of '*nola*', and the Khandala specimen—a male—is the only one of its kind that has come my way: but it would be interesting if observers who have the opportunity would ascertain whether the differences I find hold good through a long series of Mahableshwar specimens.

Appias albina, Boisduval.—New to the list. A male was taken near the Bhore Ghat Reversing Station in October 1906.

Catopsilia florella, Fabricius.—This form, as separated from *C. pyranthe* by Bingham, is fairly common everywhere.

Hebomoia australis, Butler.—The western and southern race of *H. glaucippe* Linn. The points of difference noted by Bingham do not seem to be very constant, especially in regard to the presence or absence of the inner black edging to the orange apical patch. Specimens taken in the limits assigned to *H. australis* are sometimes all but indistinguishable from some of *H. glaucippe* from Sikkim and Burma.

Everes argiades, Pallas.—Not in the original lists. Occurs very sparingly in the Ghats after the rains.

Castalius decidea, Hewitson.—Is far more common than *C. rosimon*, Fabr. both in the hills and the plains. Keeps as a rule to damp shady glens.

Nacaduba atrata, Horsfield.—Not uncommon on the Ghats, but very local. Seldom found far away from damp water courses.

Curetis dentata, Moore.—A female of this variety of *C. bulis*, Doubleday and Hewitson, taken at Khandala in October 1905. The species is not included in Mr. Comber's lists and is probably very rarely found.

Amblypodia anita, Hewitson.—This species has apparently not hitherto been recorded on the Bombay side further north than Karwar. Though I took several males on the Ghats, I cannot say they are common. They were only to be found at the end of October and then only on one particular tree growing in one of the ravines above the Khandala Hotel: and though I got one or two on nearly every occasion I went to this tree, I never, though I explored the country round Khandala pretty extensively, saw the species anywhere else. All the specimens had the undersides darker and more blotched than is typical; but this was probably due to dry weather dimorphism.

Aphnæus concanus, Moore.—New to the lists. One taken at Khandala in October.

Rapala orseis, Hewitson.—Rare. One female on the Ghats near Khandala (October).

Parnara narooa, Moore.—New to the lists. A couple taken near Andheri after the rains.

Parnara plebeia, de Niceville.—Not hitherto recorded on the Bombay side. A female taken below Khandala in October last year agrees very closely with de Niceville's description of the species (Watson's *Hesperidæ Indicæ*, page 40).

Odontoptilium sura, Moore.—Also an addition to the list, and new to Western India. One near Khandala, October 1907. Very scarce.

Coladenia tissa, Moore.—Khandala, October 1907. Scarce.

Celænorrhinus fusca, Hampson (?).—The description of this species given in Watson's book (page 141) is somewhat scanty, and the specimen taken by me at Khandala in October 1907 is unfortunately rather a damaged one. It is, however, undoubtedly a *Celænorrhinus*, and agrees most nearly with the description of '*fusca*'. Only a single specimen taken.

The hills of the Konkan are undeniably rich in species of the 'Skipper' family; and a thorough exploitation of them would, I have not the least doubt, bring to light a number of forms new to the district if not to India as well. But to get these scarcer *Hesperidæ* one must leave the beaten track altogether; they are to be found, as a rule, only in heavy jungle or in rocky wooded nullahs and ravines, where rough scrambling is necessary—scrambling which the climate does not encourage. Unfortunately, too, the literature on the *Hesperidæ* is scanty and the family cannot easily be dealt with. Watson's book is most valuable; but the absence of a key makes it difficult to work with unless one has fairly long series, not only of the different species but of the family as a whole, available for the purposes of comparison. And there are few collections where the *Hesperidæ* are well represented.

SOME BEAUTIFUL TROPICAL TREES AND THEIR USES.

BY

H. F. MACMILLAN.

The selection of this subject I owe chiefly to the Hon'ble Mr. Ferguson, who has been lately collecting information about flowering trees in the neighbourhood of Colombo. I have for the present included under the above heading only fine flowering trees, not however that there are not many trees which are also very handsome on account of their foliage; but these might well form the subject of another paper. The former may be distinguished by the convenient term Flowering Trees, which does not of course apply in a botanical sense, since all trees normally produce flowers, whether these are showy or inconspicuous. Many flowering trees of the tropics are of surpassing beauty and magnificence, and the more they are seen and the larger their number together, the greater do their beauty appeal to one. They have, with few exceptions, no counterparts in temperate countries, unless they might by a stretch of the imagination be considered as greatly magnified forms of the more showy annuals and perennials which so effectively adorn gardens and parks in cooler climes.

* * * * * * *

The following are some of the most beautiful flowering trees of the tropics, given in alphabetical order. By coincidence the first on the list is perhaps the finest flowering tree in the world, *viz.*:—

AMHERSTIA NOBILIS (*Leguminosæ*), named in honour of Lady Amherst. A medium-sized tree, native of Burma, and considered the most beautiful of all flowering trees. Its immense candelabrum-like sprays of red and yellow flowers, drooping from every branch of the tree among the handsome foliage, present an appearance of astonishing elegance and loveliness. It is in flower during the greater part of the year, but its chief flowering season is January to March. The tree thrives in the moist low-country up to 1,600 feet, and requires good rich and well-drained soil. It does not seem to flourish near the sea, and I believe is seldom met with about Colombo. Introduced to Ceylon in 1860.

BAUHINIA TRIANDRA (*Leguminosæ*)—" Mountain Ebony ".—A small tree with very showy large flowers, borne in racemes, pink merging into purple. Each of the leaves is composed of two leaflets joined at the base; hence the genus takes its name from Bauhin, twin brothers and botanists.

BROWNEA ARIZA (*Leguminosæ.*)—A small spreading tree with pinnate drooping foliage, native of Tropical America, and introduced to Ceylon in 1884. It bears from the ends of the branches large clusters of blossom which

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S — After the common name means Sinhalese.
T = Tamil.

weigh the branches down. The flowers are of a deep rose colour, of great beauty, resembling large Rhododendron flowers.

BROWNEA COCCINEA (scarlet).—A short spreading tree, native of South America and introduced to Ceylon in 1849. It is distinguished from the other Browneas by the small but numerous clusters of scarlet flowers produced on the stem and older branches.

BROWNEA GRANDICEPS (large-headed).—A larger and handsomer tree than either of the former two, native of Venezuela, introduced into Ceylon in 1870. A very beautiful tree when in blossom, the flowers being borne in very large heads at the ends of the branches, bright red in colour. The foliage too is very handsome. The young leaves are produced in long, drooping branches similar to those of Amherstia.

BROWNEA MACROPHYLLA (large-leaved).—A strong growing species, introduced in 1894. It is of a less free-flowering habit than those already named, but the flowers are the largest, and are of a pleasing shade of rose colour ; the long coloured stamens also distinguish the flowers from those of the other species of Brownea.

BUTEA FRONDOSA (*Leguminosæ*).—"Bengal kino-tree" ; "Gas-kel," S. ; "Parasu," T.—An erect tree with trifoliate leaves indigenous to the forests of the dry region of India, Ceylon, and Burma ; reaches a height of about 40 feet, and bears in the dry months a profusion of orange-scarlet flowers. The tree furnishes a resin ("Kino") and a useful fibre ; a lac is produced on the young twigs, and the flowers are used n India for dyeing yellow and orange-red.

CASSIA FISTULA (*Leguminosæ*).—"Indian laburnum" ; "Puddingpipe" : "Ehela," S. ; "Tirukkontontai," T.—A small upright tree, common in the forests of the dry region of Ceylon and India. A beautiful object when in blossom, the flowers being bright yellow borne in numerous long pendulous racemes. The flowers are used in temple ceremonies, and the astringent bark for tanning and in native medicine. The black cylindrical pods grow from 20 to 30 inches in length ; the pulp of these is a well-known purgative. Suited chiefly, to the rather dry country, but with good drainage will thrive in the moist districts up to 2,000 feet,

CASSIA GRANDIS (great)—"Horse Caccia."—A native of South America growing to a height of 40 to 50 feet ; bears a profusion of pink inflorescence during the dry months of February and March, when the tree is completely deciduous. The thick, curved pods, the pulp of which has an offensive smell, are produced in abundance in June.

CASSIA MARGINATA (marginated leaf).—"Ratu-wa," S. ; "Vakai," T.—A small graceful tree with spreading drooping branches, common in the dry region of Ceylon and also in South India ; very ornamental when bearing its racemes of rose-coloured flowers, produced in July and August.

CASSIA MULTIJUGA (many-yoked)—A slender quick-growing tree of Tropical America, introduced to Peradeniya in 1851. Remarkably beautiful when in full flower during August and September, being practically smothered with very large racemes of bright yellow flowers, suggesting a magnified Calceolaria. The tree luxuriates in the moist climate of Peradeniya, but does not produce seed here. At Anuradhapura, however, in the drier region, it bears fruit.

CASSIA NODOSA (knotted, referring to the knotted stems).—A moderate-sized tree, native of Eastern Bengal and Malaya, very beautiful when bearing its profusion of bright pink and rose-scented flowers, during April and May. The flowers are followed by cylindrical pods, 12 to 15 inches long. The tree is deciduous in the dry weather.

COCHLOSPERMUM GOSSYPIUM (*Bixaceæ*).—"Kinihiraya" or "Ela-imbul," S.; "Kongu," T.—A rather small tree, native of Central India. It has become semi-naturalised in dry districts in Ceylon, and is often found planted near Buddhist Temples. A beautiful tree when in blossom, during February or March, with its large bright yellow flowers, which are esteemed as temple offerings. The tree is deciduous in the dry weather; thrives in either dry or moderately wet districts below 2,000 feet.

COLVILLEA RACEMOSA (*Leguminosæ*).—Named in honour of Sir Charles Colville when Governor of Mauritius. A medium-sized tree (30 to 40 feet high) with handsome pinnate leaves, native of Mauritius and Madagascar. It bears in September large, erect close racemes of bright scarlet flowers, presenting a very showy appearance. Suited to the moist or moderately dry low-country.

GLIRICIDIA MACULATA (*Leguminosæ*).—"Madre."—A small quick-growing elegant tree introduced from the West Indies about 1889. It bears long arching feathery leafy branches, which in the dry weather drop nearly all their leaves and produce along the greater part of their length masses of pinkish purple flowers, making the tree a striking object for a time. It thrives up to 2,000 feet, and may be seen flourishing in the Victoria Park and elsewhere about Colombo. Its quick growth and light feathery habit recommend it as an excellent shade and green manure tree. It belongs to the nitrogenous class of *Leguminosæ*; also forms good support for vanilla vines. The introduction of this into Ceylon was effected by Mr. C. Drieberg when Superintendent of the Agricultural School.

JACARANDA MIMOSÆFOLIA (*Bignoniaceæ*).—A very elegant tree both on account of its leaves and flowers. It reaches a height of 40 to 50 feet, and bears a profusion of blue bell-shaped flowers all along the older wood of the branches. Flowering seasons, February to May, and August to September. The elegant bi-pinnate mimosa-like leaves make the tree well worth growing as small foliage plants for pots in verandahs.

KLEINHOVIA HOSPITA (*Sterculiaceæ*).—A large handsome Malayan tree, introduced to Ceylon about 1820; it bears large terminal panicles of pink or rose-coloured flowers, which appear during July and August. Thrives in the moist low-country.

LAGERSTRŒMIA FLOS-REGINÆ (*Lythraceæ*)—"Pride of India"; "Murutu," S.—A tree of extraordinary beauty, about 50 to 60 feet in height, native of Ceylon, India and Malaya. It is undoubtedly one of the most strikingly showy of flowering trees. It is deciduous for a short time in the dry weather, but from April to July or later it bears from the ends of the branches huge panicles of large mauve or pink flowers. There are two or more varieties with the flowers varying from shades of mauve to a lovely bright pink.

LAGERSTRŒMIA TOMENTOSA (*Lythraceæ*).—A moderate-sized handsome tree, native of hot and moist parts of Burma, introduced at Peradeniya in 1891. It blossoms twice a year, April and October, bearing large erect panicles of lovely white flowers, produced from the end of every branch. A very ornamental tree when in blossom.

LYSIDICE RHODESTEGIA (*Leguminosæ*).—A large handsome tree, native of Southern China, introduced at Peradeniya in 1882. It thrives here and bears from December to February masses of pink or rose-coloured inflorescence, produced at the extremities of the branches. The persistent coloured calyces render the tree very showy for several weeks. A handsome tree when in flower.

MESUA FERRA (*Guttiferæ*).—"Iron-wood"; "Na-gaha," S.; "Naka," T.—A moderate-sized, broadly conical, slow-growing tree, native of the hot and moist regions in Ceylon, India and Malaya. A very handsome tree, much in favour for planting near Buddhist temples. It blossoms profusely in the months of April or May, the large white flowers with yellow stamens, being delicately scented. The young leaves, which appear twice a year, are of an intense blood-red colour, passing through delicate shades of pink into the dark green of the adult growth.

MILLINGTONIA HORTENSIS (*Bignoniaceæ*).—"Indian Cork-tree."—An erect tree with deep-green finely divided foliage, reaching a height of fifty feet or more; bears in November and June a profusion of long, pure white, fragrant flowers. The tree is a favourite in Indian gardens; thrives up to 2,000 feet in Ceylon.

ONCOBA SPINOSA (*Bixaceæ*).—A small bushy tree of Arabia with light green, small ovate leaves. It bears in April from the underside of the young branches large single white flowers with yellow stamens, very delicately scented and suggesting in appearance wild dog-roses of a large size. Introduced at Peradeniya in 1883. It has not yet set fruit.

PELTOPHORUM FERRUGINEUM (*Leguminosæ*).—"Iya-vaki," T.—A very large quick-growing, symmetrical tree, with a spreading top and very graceful fine foliage, indigenous to Ceylon and Malaya. The young leaves and shoots are covered with a brown velvet tomentum, from which the tree takes its specific name. It flowers twice a year, but during different months, being remarkable for the fact that when one tree is in flower, another (of the same kind) side by side may be in fruit, another may be deciduous; the flowers are rusty yellow, sweet-scented, and borne in large erect panicles. Dr. Trimen states:—"It is a magnificent sight when in full blossom." It is suited to the dry region, but also thrives to perfection in the moist region, up to 1,800 feet elevation.

PLUMERIA ACUTIFOLIA (*Apocynaceæ*).—"Temple tree"; "Pagoda tree" sometimes called "Frangi-pani"; "Everiya" or "Arahya," S.—A low, spreading succulent tree or shrub, introduced from Tropical America and now naturalised in Ceylon, India, &c. It is a familiar tree in the Eastern tropics at low elevations, and in the low-country of Ceylon generally, especially near temples. It is bare of leaves throughout the dry weather. when it bears large corymbs of white and highly fragrant flowers.

PLUMERIA RUBRA (Red).—A tree similar to the latter but of a less spreading habit, bearing bright crimson flowers. Very showy.

POINCIANA REGIA (*Leguminosæ*).—"Flam-boyante;" "Flame tree;" "Gold Mohur."—A gorgeous tree when in full flower, bearing during the months of March to May immense panicles of scarlet or orange and yellow flowers. It is a very striking object in and about Colombo at this time of year. The tree grows from 50 to 60 feet in height, and has handsome fine feathery leaves.

POSOQUERIA LONGIFLORA (*Rubiaceæ*).—A moderate-sized, quick growing tree, with large deep-green leaves, native of Tropical America It produces long tubular white and sweet-scented flowers, borne in pendulous clusters, during May and September. Suited to moist districts up to 2,000 feet.

PTEROCARPUS ECHINATUS (*Leguminosæ*).—A moderate sized spreading tree, native of the Philippines, introduced at Peradeniya in 1882; bears large racemes of pale yellow flowers at the end of the branches during April and May. Very ornamental when in blossom. Suited to the low-country.

SARACA DECLINATA (*Leguminosæ*).—A small tree, native of Sumatra, introduced at Peradeniya in 1870. It forms a beautiful sight when bearing its huge heads of bright orange yellow flowers, produced on the stems and older branches during February and March. Thrives best in partial shade in the moist low-country.

SARACA INDICA (Indian)—"Diya-ratmal" or "Diya-ratambala," S.; "Asoca Britsch," Hind.—A small spreading tree, native of Ceylon and South India. On the stems and branches are produced in January to March large sessile clusters of sweet-scented flowers, which change from yellow to orange and red. The young leaves are pendulous as in Brownea and Amherstia. Thrives in shady situations, especially near water, in the wet or semi-dry districts below 1,800 feet.

SCHIZOLOBIUM EXCELSUM (*Leguminosæ*).—A very large quick-growing tree, with fine bi-pinnate feathery leaves, native of Brazil. Introduced in 1872 at Peradeniya, where it luxuriates, blossoming and producing fruits regularly. The flowers are borne in enormous erect racemes, of a bright yellow colour, during February and March, when the tree is quite bare of leaves. The flowers are at once followed by beautiful feathery young foliage. Thrives up to 1,500 feet in the moist region.

SOLANUM MACRANTHUM (*Solanaceæ*).—"Potato tree."—Amedium-sized quick-growing and soft-wooded tree of Brazil, reaching a height of 30 to 50 feet introduced to Ceylon in 1884. It is a handsome object on account of its large and rather spiny leaves but is particularly ornamental when in full blossom.

The large blue and white flowers, with conspicuous yellow anthers, are produced at most seasons of the year, but more especially after dry weather Thrives best in particularly shaded situations at elevations below 3,000 feet. This is the only species of the potato order that grows into a tree form.

SPATHODEA CAMPANULATA (*Bignoniaceæ*).—A tall erect tree from western Tropical Africa, introduced into Ceylon in 1873, and now fairly commonly planted about Kandy and elsewhere as an ornamental shade tree. Its large bright orange-red, erect flowers produced at the tips of the branches throughout the wet season, render it strikingly handsome and conspicuous at a distance. The unexpanded flowers contain a quantity of water, hence the tree has been christened the " Fountain-tree." Thrives up to 1,600 feet.

STERCULIA COLORATA (*Sterculiaceæ*).—" Malarparutti," T.—A moderate sized tree of 40 to 50 feet in height, indigenous to the dry region of Ceylon but thrives also in the moist districts. The brilliant orange scarlet flowers, appearing in great profusion when the tree is leafless (February to March at Peradeniya). render the tree a handsome and conspicuous ornament. The veddas (aboriginals of Ceylon) are said to call the tree " Kenawila," and sing odes to it.

STEREOSPERMUM XYLOCARPUM (*Bignoniaceæ*).—" Padri tree " of India.—A large spreading tree, native of South India, deciduous for a short time in the dry weather. It bears for a week or two a profusion of white bell-shaped flowers. Thrives up to 1,500 feet.

TABEBUIA SPECTABILIS (*Bignoniaceæ*). - A small tree of Venezuela and the West Indies, introduced at Peradeniya in 1881. For a short period in April or beginning of May, when bare of leaves, the tree is an exceedingly beautiful sight, being literally covered with masses of yellow flowers, which as they drop form a golden carpet on the ground. Thrives at Peradeniya (1,500 feet) but as yet only rarely produces seed here.

(*The above article is from " The Tropical Agriculturist and Magazine of the Ceylon Agricultural Society " for June* 1908.)

NEW SUB-SPECIES OF BLANFORD'S BUSH-WARBLER

(*HOREITES PALLIDIPES.*)

At a recent meeting of the British Ornithologists Club Dr. Hartert described a new sub-species of *Horeites pallidipes* as follows:—

" ***Horeites pallidipes osmastoni***, subsp. n.

Adult male.—Differs from *H. p. pallidipes*, Blanf. (a species breeding in the Himalayas), in having the upper surface much deeper (almost sepia) brown, and the bill altogether larger.

Hab.—Andaman Islands.

Type in the Tring Museum: ♂ Port Blair, 11, XII, 1906: B. B. Osmaston coll.

Obs.—This form was found breeding, and Mr. Osmaston obtained its eggs."

REVIEW.

"THE WORLD'S BIRDS"—BY FRANK FINN (HUTCHINSON, LONDON, 5*s. net*).

The writer of this book is well known to many members of this Society as the former Deputy Superintendent of the Indian Museum and the author of several small works on Indian birds. From such an ambitious title, one might imagine that mention would be made of all the different kinds of birds found throughout the world, but this is obviously impossible when it is taken into account that there are only some 180 pages in which to deal with the 14,000 different species which are known to exist. In his preface Mr. Finn tells us that "the aim of this work is to afford a practical and comprehensive survey of the living birds of the world for the benefit of those who have not time or inclination to engage in dissection or detailed museum work," and he also states his reasons for taking the various families in alphabetical order instead of adopting any definite scheme of classification.

The names of the principal parts of birds, both internal and external, are explained in a short introductory chapter, and a general comparative survey is given of the various kinds of nests made by birds together with a few remarks on seasonal change, migration and geographical distribution. Each family is treated under a number of sub-headings, such as size, eggs, flight, distribution and important species, and the information is given as concisely as possible. In more than one instance Mr. Finn places several families under one heading, especially in the case of the Passerine birds, which he calls Passeridæ; and this method does not lend itself to the system of sub-headings, as it is hardly possible to treat such a large number of birds with very distinct habits in this way.

It may be that this work will fulfil the purpose suggested in the prospectus, but we doubt if the book will be of much use to "museum-curators or bird-keepers."

The book is illustrated with a number of good photographs, chiefly taken from living examples in the Zoological Societies' gardens, together with a few of stuffed specimens. They have been selected, as far as possible, to show representative birds of the less familiar families and uncommon species. It is unfortunate that no guide is given to the size of the different birds illustrated; for instance, few people, we think, could recognise the bird on the plate facing page 114, without seeing the name.

CORRESPONDENCE.

PROPOSED ALTERATION TO THE FOREST RULES IN REFERENCE TO THE CLOSE TIME FOR QUAIL AND BUSTARD IN THE BOMBAY PRESIDENCY.

Some correspondence with the Bombay Government on the above subject was published in the last Journal (page 665 of this Volume), and the resolution given below will, it is considered, prove more satisfactory than the present dates of the close season.

Rules under the Indian Forest Act.

Proposal to change the date of the close season for Quail.

No. 8105.

REVENUE DEPARTMENT,
BOMBAY CASTLE, *8th August* 1908.

RESOLUTION.—On mature consideration Government do not find that sufficient reason has been shown for altering the dates of the close season fixed in the Appendix to Government Notification No. 5627, dated 18th August 1903. It does not seem necessary to prescribe a close season for the grey-quail. As regards the rain-quail, the close season proposed, namely, 15th July to 30th November, is much too late. A vast majority of these birds breed in June and July, but they are already mated in April, and Government consider that they should be protected from that month. They are mature by October and therefore need no protection then. Moreover, as grey-quail and rain-quail are commonly shot together, the former in considerably large numbers, and it requires a very quick eye to distinguish one from the other on the wing, it would not be possible to enforce the rule if the close season were extended to 30th November. Of the other quail, the bush-quail is the only one of importance, and though exceptionally late broods are not uncommon, Government consider that the 30th September is late enough for it. All gallinaceous birds will nest a second, and even a third time if the entire nests are destroyed, and this fact accounts for the many instances of late breeding which have been observed. The rules ought not, however, to be framed to meet exceptional cases and seasons, and great scrupulosity will defeat the object of the rules. If the close season now prescribed is enforced, it will, in the opinion of the Governor in Council, meet all reasonable requirements and serve all practical purposes.

J. E. C. JUKES,
Under Secretary to Government.

PROPOSED INVESTIGATION AND PROTECTION OF THE FISHERIES OF WESTERN INDIA.

As the result of the correspondence with the Bombay Government on this subject, the following Resolution has been published :—

Fisheries—

Measures for the improvement of—in the Bombay Presidency.

No. 5472.

REVENUE DEPARTMENT,
BOMBAY CASTLE, *2nd June* 1908.

RESOLUTION.—Government have read with interest the papers on "Estuary fishing—some remarks on its decadence, as an industry, in the Konkan, Western India," and "Protective Legislation for Indian Fisheries" forwarded by the Bombay Natural History Society. In the former of these papers the writer Mr. Wallinger of the Bombay Forest Department, depicts the evil effects of the methods employed by fishermen in the Konkan in catching fish in estuaries and creeks. In his opinion the methods are far too destructive in their operation without any compensating results either to the fishermen or to the fish-consuming population, and have brought about the extinction of what was some few years ago a flourishing industry. The paper ends with an enumeration of some of the legislative measures adopted from time to time in England, Scotland and Wales for the preservation of fish. The second paper is a reproduction of an article that appeared in *The Field* of 2nd and 9th May 1903, in which the writer complains of the deterioration in the fish supply of Northern India brought about by what he considers to be an absence of protective measures, and concludes with a powerful appeal to Lord Curzon, the then Viceroy and Governor-General of British India, to have recourse to legislation to put a stop to a state of affairs, which, if allowed to continue, will, in his opinion, lead to an extinction of the fresh water fisheries of that part of India.

2. In forwarding these papers, the Bombay Natural History Society expressed the hope that Government may be able to see their way to introduce some legislation for the protection of the fishing industry in Western India, with the view of preventing what they consider to be the wholesale destruction of the fry of estuary and fresh water fish, and point out that the beneficial results of any effective legislation would be apparent in most creeks and rivers in a few years. The Society further suggest the expediency of creating a Fisheries Department for the purpose of enforcing the legislative measures recommended by them, and observe that if further inquiries are deemed to be necessary to justify the introduction of legislation, the desirability of appointing a Commission or an Officer to continue the investigations already started may be considered. These recommendations and suggestions of the Society are supported by the Chamber of Commerce, Bombay.

3. Government have given careful consideration to the representations of the Bombay Natural History Society and the Chamber of Commerce, Bombay, as well as to the two papers forwarded by the former body. While not unmindful of the great importance of the fishing industry, Government are unable to subscribe to the opinion that the estuary and fresh water fisheries of the Bombay Presidency are being so overworked or are threatened with such imminent destruction as to necessitate recourse to legislation. To make this point clear, it is necessary to refer to the existing condition of fisheries--marine, estuarine and fresh water—in the different parts of the Presidency.

4. The Governor in Council considers it desirable to make a passing reference to what appears to him to be a prevailing misapprehension. It seems to be argued that because the Governments of Madras and Bengal have undertaken inquiries into the fisheries of their respective provinces and have entertained special establishments for the purpose, the Bombay Government should follow the same course as regards the fisheries within their territorial jurisdiction. It is, however, forgotten that conditions in this Presidency differ widely from those which obtain in the other two provinces. The fish-eating population of Bombay is not so large as that of either Madras or Bengal, while the fishing industry of the first named province has already reached a high stage of development.

5. With the exception of a few mountain torrents, which do not count, the fresh water fisheries of Sind are furnished exclusively by the Indus, and back waters, lakes and canals supplied with water from the Indus. The people are great fish eaters, and the supply of fish is abundant, there being no sign of any diminution, although the means of capture employed are as effective as any that have been devised in any country. Sea-fishing is carried on from Karachi and the mouths of the Indus on a great scale, in large boats, equipped for all practical purposes as well as English fishing boats. A great deal of fish is cured in the fish-curing yards, and there is a flourishing trade in fish maws and shark fins in the port of Karachi. Large quantities of oysters and fish in ice are sent up-country.

6. In Gujarat, though it possesses two noble rivers, the Narbada and the Tapti, many smaller ones and numerous tanks, inland fisheries are not of so much importance, as owing to caste prejudices the mass of the population away from the sea-coast are averse from eating fish. Many of the tanks and some parts of the rivers are jealously guarded by the dominant castes and can be fished only at actual peril of life. Some of the lower classes take a few fish out of the rivers and tanks, and in the upper waters the aboriginal tribes eke out a precarious livelihood with fish which they catch by every primitive device. It may be said generally that the tanks and rivers swarm with fish which nobody touches. On the other hand, the sea-fishing is a strong and flourishing industry. Along the coast, the fishing is carried on in small boats, and the fish not eaten fresh is sun-dried. The deep sea-fishing employs large well-equipped vessels, which fish the banks in the Gulf of Cambay and off the Kathiawar coast

They keep the sea for weeks together in the fair season, running into Diu for supplies of salt. The catches are salted at sea and are imported at the end of the season. Large quantities of salted fish from this source are brought down to Bombay.

7. In the Northern and Southern Konkan, the rivers consists mainly of estuaries running from inland. The fresh water courses of those rivers are short and of no great volume, except in the rains. The beds of most of the tributary streams are dry during a great part of the year. It follows that the fresh water fisheries are not of so much importance, though a certain quantity is taken from the streams as they fall, by means of weirs, nets and traps. Much of the fish so taken would die in any case owing to the drying up of the streams. On the other hand, the sea-fishing is of great importance. The sea is thoroughly exploited to a distance of eight or ten miles from the coast, by large vessels, whose appliances are quite as good as those used by fishermen on the South coast of England. Nearer land, smaller boats are used, and in the estuaries and on banks stake nets are permanently fixed. The amount of capital employed is considerable. The fishermen who supply the Bombay Market have learnt the use of ice, and the amount of fish sent from Bombay to all parts of India must be considerable.

8. To sum up, the sea-fishing industry in this Presidency is in a high state of development; the fresh water fisheries are important and flourishing in Sind, while elsewhere they are insignificant.

9. From the foregoing short sketch it will be evident that so far as this Presidency is concerned there is no need for the adoption of preventive measures. Government are however of opinion that the question of improving the fishing industry can be considered with advantage. The subject falls naturally under the following heads:—

(1) The exploitation of the fishing grounds:

(2) The preservation of the supply of fish;

(3) The utilization of the catches by access to markets, curing, smoking canning, etc.;

and each of those heads must be considered with reference to fisheries in (1) fresh water, and (2) the sea and estuaries.

10. It does not appear that any action on the part of Government is called for in this Presidency in respect of inland fisheries, or in respect of the exploitation of sea fisheries including fishing in estuaries. It is in this latter respect that the great difference between Bombay on the one hand and Bengal and Madras on the other is most apparent. The sea-fishing industry of this Presidency is in a high state of development, while in Bengal it has apparently yet to be created and in Madras the reports contain much evidence of the inferiority of the enterprise and equipment of the industry.

11. The question of the preservation of sea fisheries does not arise, as owing to the amazing fecundity of the fish, the harvest of the sea is so bounti-

ful and so constant that overfishing is impossible. No means of destruction which man can devise can effect any appreciable reduction in the supply. Bays and estuaries may be overfished, but even in these localities it is generally the distribution of the catches rather than their amount which is affected.

12. As regards the last branch of the subject—the utilization of the supply of sea fish, Government consider that great improvements are possible. The fish-curing yards turn out large quantities of fish, but methods of curing are imperfect. It is also necessary to consider whether more liberal arrangements can be made for the supply of salt to boats for curing at sea. The question of establishing a canning industry not only for sardines, but for other varieties and their transport and access to markets, also requires consideration.

13. It is desirable that all these and cognate questions should be carefully examined: Government however do not think it necessary to depute a special officer to carry out these investigations, which, in their opinion, can be undertaken by the Collector of Salt Revenue, Bombay, in addition to his ordinary duties. The Salt Department furnishes special opportunities for an inquiry of this nature. Its subordinate Officers all along the coast are in close touch with the fishing population, and the fish-curing yards are under its control. The Governor in Council accordingly desires that the Collector of Salt Revenue should carry out the inquiries indicated in paragraph 12 of this Resolution. Mr. Lucas should visit the coast during the fishing season between October and January, and submit his report as soon as his investigations are complete. On receipt of this report it will be considered what measures should be taken.

J. E. C. JUKES,
Under Secretary to Government.

MISCELLANEOUS NOTES.

No. I.—STRANGE ACCIDENT TO A SNOW LEOPARD (*FELIS UNCIA*).

In May 1906 whilst shooting in Western Hundes I came on a dead snow leopard which had met its death in a curious way. On leaving Nilang village 11,300 ft. in the Jadh Ganga valley and which was deserted at the time of the year, my wife and I started for our next camp up the valley.

The road on leaving the village follows the river bed for some considerable way. The bed of the river here is broad and shingly and along this shingle bed close to the hill side a small stream about six feet wide, having its origin in some springs about 500 yards or so from the village, has cut its way joining the main river close to the village.

The load coolies were ahead of us and as they crossed the small stream near the springs we saw one of them stop and pull out something which looked like a leopard's tail, he apparently did not think much of it as he dropped it and went on. On reaching the spot we saw a fine snow leopard, which turned out to be a female, lying in the water. I had her taken out of the water and told the Shikaree to have a pull at her hair fully expecting the animal to be rotten and the hair to come away in handfuls, but to my surprise not a hair came out and to my delight on carefully examining the animal we found her to be quite fresh ; on taking the skin off we discovered the cause of death.

There were bruises all down the back and the forehead had a large dent and was smashed in evidently by a large stone. Above the stream on the hill side there was a stone slide and a fall of stones must have caught the leopard unawares either whilst crossing the slide, in which case she must have rolled down into the stream below, or whilst she was actually drinking at the stream. I cannot say if the dent in the forehead actually killed her or only stunned her, in the latter case she must have been drowned after falling into the water. The skin was in perfect condition and has been beautifully mounted by Rowland Ward.

H. C. TYTLER, Major,
17th Infantry.

Barrackpore, 10*th May* 1908.

No. II.—A LARGE SAMBAR HEAD.

In the Society's Journal for November 1907 (Vol. XVIII, page 188) the measurements of a very massive pair of Sambar horns are given. A few weeks ago I had an opportunity of measuring a very large and massive pair of horns belonging to Mr. William McInroy of Lude, Perthshire, the measurements of which, I think, it may perhaps interest you to have :

	Right horn.	Left horn.
Round burr	12″	12″
Middle	8¼″	8¼″
Length outside curve	42½″	43½″
„ straight	36″	36″
Span between top points ...	26¼″	
„ „ brow	15″	

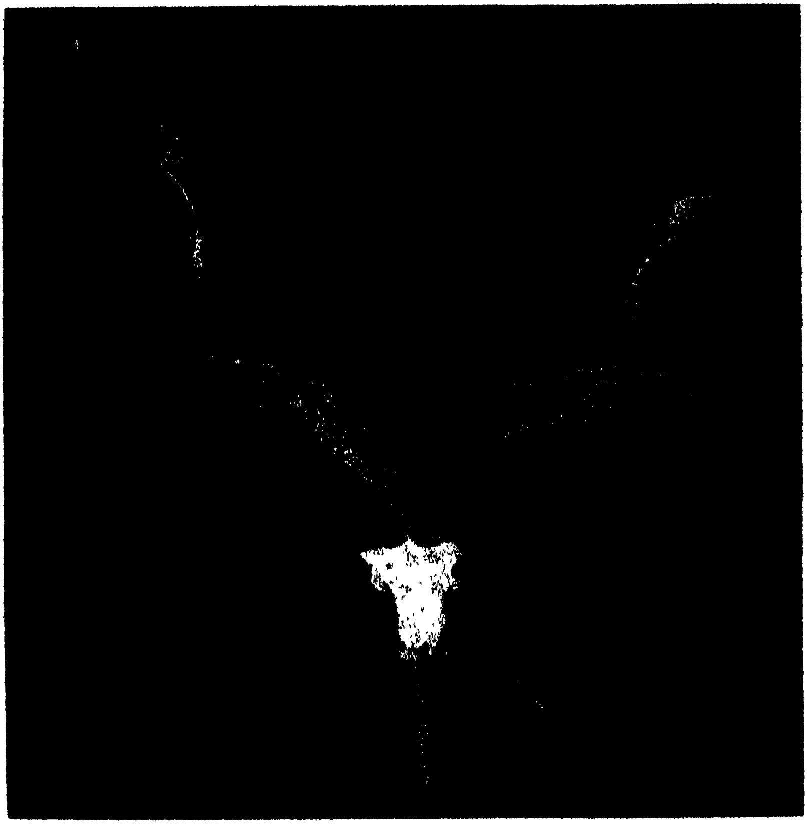
The above pair of horns were presented many years ago to the present owner's father. Their history is unknown.

C. MacI. RITCHIE, Captain,
R.H.A.

Woolwich, England, *3rd May* 1908.

No. III.—A RECORD MARKHOR (*CAPRA FALCONERI*) HEAD.

The accompanying photograph represents the head of a markhor (Astor variety) shot by me on the 23rd February 1907, in the Gilgit District, on a hill overlooking the Gilgit-Gupis Road about 13 miles from Gilgit.



The measurements as recorded by Rowland Ward are as follows:—

Right horn on curve	59⅛″
„ „ straight	42¾″
Left horn on curve	60¾″
„ „ straight	39¼″
Girth	11¼″
Spread from tip to tip	46″

The age of the animal was judged by the shikari with me to be about 12 years.

H. BARSTOW, Captain,
(38th Dogras,)
Assist. I. O., Kashmir Imperial Service Infantry.

Gilgit, Kashmir, *31st May* 1908.

No. IV.—THE PERIOD OF GESTATION IN MAMMALS.

In few matters connected with natural history is our information so vague and unsatisfactory as it is with regard to the duration of the period of gestation in different species of mammals. From the very nature of the case, it is, of course, a subject in regard to which there is great difficulty in acquiring accurate information, and as a general rule, such information can be obtained only from animals in captivity. Even, however, in the case of species which have long been domesticated remarkable mis-statements have not unfrequently been made. As regards the guinea-pig, for example, it was stated by Schreber that the period of gestation was only three weeks, and this statement seems to have been generally accepted till 1891, when the late Professor A. Nehring, of Berlin pointed out that it was really sixty-three days. In the case of wild species errors are still more serious, as exemplified in the case of the tapir, whose gestation period is stated in the second edition of Brehm's *Tierleben* to be four instead of thirteen months. In these circumstances it is satisfactory to know that Dr. O. Heinroth, of the Berlin Zoological Gardens, has taken up the study of this subject in a thorough and careful manner, and that the results of some of his investigations have been published in a recent issue of the *Zoologischer Beobachters* (vol. xlix., p. 1), wherein he expresses his indebtedness to Dr. Wunderlich Koln and Mr. Blaauw for many details. The list includes a large number of species whose gestation periods have been determined with more or less complete accuracy; and from these the following items are selected:—

The hoofed or ungulate mammals present the longest duration of gestation in the whole class, and it is noteworthy that, as a whole, the perissodactyles exceed the artiodactyles in this respect, the period of gestation in the rhinoceroses, however, being still unknown. The list is headed by the Indian elephant, in which the period ranges from 20 months 21 days to 22 months; next comes the giraffe with 14 months, the American tapir with 13 or 13½, the Indian tapir with 13, the Somali wild ass and its domesticated relative, together with the mountain zebra and the Asiatic wild ass, about 12 months: Burchell's zebra, 11¼ to 13, and the horse 11 months. Camels and llamas also occupy a high place in the series, the period being given as 13 months in the case of the two species of camel, from 11⅓ to 13 in that of the llama, and 11¼ and 11 respectively in the guanaco and alpaca. In the Bovidæ the longest periods occur in the anoa of Celebes, 9½ to 10 months, and the beisa oryx, 10 to 8½ months. Then comes the roedeer, from 9 to 9½ months; Pere David's deer, 9⅓; the cow, zebu, gayal, bison, yak, and sambur, 9; eland and gnu, from 8½ to 9; wapiti, 8½; hippopotamus, nilgai, elk, hartebeest, sable antelope, and waterbuck, 8; bushbuck, blesbok, and four-horned antelope, 7½; blackbuck and chamois, 6; springbuck, 5⅔; chevrotain, 5½; Nubian ibex, goats, and sheep, 5; and swine, from 4 to 4¼. It will be seen from these figures that while as a rule the larger species have the longer gestation periods, there are numerous exceptions to such a progressive series.

As to the primates, data are very scanty, but the anubis baboon is stated to go 7 months (against a former record of 5), which suggests that the alleged period of 4½ months for the mandril is much too short. In two species of lemur the gestation period is given as 3¾ months.

In the more specialised land carnivora the gestation is very short, being about 3½ months in the lion and tiger, 3⅓ in the jaguar, 3 in the puma, leopard, and striped hyæna, 56 days in the cat, and 9 weeks in the wolf, jackal, and dog. On the other hand, the brown bear goes about 7, and the polar bear, it is said, approximately 8 months with young, while in the common seal and the Californian sea lion the period is believed to be 11 and 11¼ months respectively.

The rat and the house mouse claim the record for shortness with 21 days each, while the hamster comes next with 22 days, followed by the domesticated rabbit with from 28 to 30 days. In the Edentata the great anteater goes 6 months, and the hairy armadillo 2 months, while the only available record among marsupials is the great grey kangaroo with 1¼ months.

(*From " The Field " of 4th April* 1908.)

No. V.—NOTE ON THE OCCURRENCE OF THE INDIAN CHEVROTAIN OR MOUSE-DEER (*TRAGULUS MEMINNA*) IN BURMA.

In the last number of the Society's Journal, Vol. XVI, No. 4, page 739, a map is given showing the distribution of *Tragulus meminna*, the Indian Chevrotain, but no mention is made of its occurrence in Burma. It is excessively common along the sea coast of Moulmein and in January 1887 I shot one in dense evergreen forest at 2,000 feet elevation which is rather extraordinary.

T. A. HAUXWELL,
Conservator of Forests.

FOREST LODGE, MAYMYO, BURMA,
8th December 1905

[This Note was mislaid and has only recently been found, hence the date.—EDS.]

No. VI.—A BEAR ATTACKING A TIGER.

The following will, I think, interest the members of our Society:—

Last hot weather I shot a large male tiger in a beat. Shortly afterwards a bear (an old female) came up the same path the tiger had come and close in front of the beat. The bear did not see the dead tiger until a few yards from it. She stood up on her hind legs in astonishment apparently, and then with a roar (I think) rushed at the tiger, and began biting and clawing it furiously behind. My sister-in-law, who was sitting with me on a rock, shot the bear I send a bad photograph of the bear biting the tiger, taken after death of course.

F W. CATON JONES, Lt.-Col., R. A. M. C.

Kamptee, C. P., *July* 18*th*, 1908.

[The photograph referred to is unfortunately not sufficiently good for reproduction. On page 707 of Vol XV. of our Journal Capt. W. H. Lane recorded a fight between a tiger and a Malay bear in which the tiger ate the bear and this note produced another one (page 50[illegible], Vol XVI) from Mr. G. K Wasey, in which he refers to an encounter between a tiger and a Sloth-bear. In this case also the tiger appears to have devoured the bear.—Eds.]

No. VII.—BIRTH OF HIMALAYAN CAT-BEARS (*ÆLURUS FULGENS*) IN CAPTIVITY.

Thanks to Mr. Fritz Moller I have had the opportunity of examining two young cat-bears born in captivity in the Horticultural gardens in Darjeeling.

The mother recently captured was acquired on the 10th of May this year. On the 7th July she gave birth to two cubs, one ♂ and one ♀. I examined these when only two days old, the mother had become so tame. While the attendant extracted the cubs from their nest she squatted on a beam just above our heads, gnawing at a plantain, and though she attentively watched our proceedings, showed no distress for her little ones, so that I had ample time and opportunity for examining them.

The first thing to attract attention was the absence of the very distinctive colour and markings which are so conspicuous in the adult. Thus the glowing red of the back, from which I suppose it owes its specific title, was replaced by a pale rufous hue. The head was almost uniformly greyish white, the black and white markings which contributes to the quaint character of the adult faces being altogether absent, and the red adult face patch but faintly indicated by pale rufous. The black patch behind the ear was as conspicuous as in maturity. The black limbs and underparts of the parent were obscurely suggested in the off-spring by a dusky tinge in the otherwise greyish fur; but there was no trace of the red rings which encircle the tail. The fur appeared to me as relatively as long as in the mature animal. The tail was relatively conspicuously shorter than in the adult. On the 4th July I re-examined the cubs and measured one. From the nose to the vent was about six inches, the tail was one and seven-eighths inches, and the ears rather more than half an inch.

The eyes were not opened until the 6th of August, corroborating native testimony previously received to the effect that they opened a month after birth. I saw the family again on the 20th of August and the cubs then showed decided indication of the adult colouration. The fur was still in the main greyish dorsally and very close set almost woolly, but a few sparse hairs were appearing showing the glowing red colour of the parent. Beneath, the fur had acquired a smoky black tinge. The cat-bear is called by the Paharis about Darjeeling "Khunda."

F. WALL, C.M.Z.S., Major, I.M.S.

DARJEELING, *20th August* 1908.

No. VIII.—CROWS AND THEIR SLEEPING PLACES.

As is well known the crow rarely sleeps where he spends his day. He is a regular city man going into town for his day's business and coming out at night to the suburbs, and after the toil of the day he likes to have a good wash before he goes to bed. The writer lived for years in a well shaded compound about a mile from a city. There were always some crows about but in the evening the compound filled up with crows.

But the point of interest is the distances which crows will go to spend the night in a favored locality. One such place is a grove of trees near the bridge of boats at Lahore, and all through the evening hours crows may be seen making for that spot from all parts of Lahore itself, and not only so but we have stood at the evening hour at the extreme south end of Mian Mir and watched the crows from there making for that particular place, which was five miles distant, and not only so but as one looked south over the treeless expanse of jungle from that end of Mian Mir, one could see crows coming from beyond the horizon and making straight overhead for that place.

More than once business took us to a very small village in the Amritsar district. From about half past three in the afternoon till about half past five a constant stream of crows passed over. They were joined by a few others from the neighbourhood but the main stream came out of the horizon in one direction and passed over the horizon in the opposite. Their track was about 200 yards from side to side and they flew high in the evening, but coming back in the very earliest dawn they almost skimmed the ground. I counted 350 in fifteen minutes one evening. The place in question was about 30 miles from Lahore and they disappeared in the direction of Lahore. Where they came from I have no idea.

T. BOMFORD (REVD.).

DERA ISMAIL KHAN, *May* 1908.

No. IX.—A HOOPOE INCIDENT.

A friend of mine was detained in the upper room of a house in Kashmir where he was confined to his bed. There were gaps between the boards which formed the floor of his room, and there was a space beween those boards and another set of boards which formed the ceiling of the room below, between these boards again were considerable gaps. A pair of Hoopoes had found access to the intervening space and had arranged their nest there. My friend watched them with some interest from his bed and in due time 4 young ones were hatched out. One day the cock came in when the hen was out and he had evidently felt that the burden of catering for four youngsters was too much for him and so he seized his opportunity and taking two of them he pushed them down between the boards on which his nest was built and let them fall into the rooms below and then he "made tracks" not turning up again until the hen bird was at home and wondering what had become of half of her family. My friend was not able to understand the conversation that followed but it ought to have been interesting.

T. BOMFORD (Revd.).

No. X.—NOTES ON THE YELLOW-THROATED BULBUL (*PYCNONOTUS XANTHOLÆMUS.*)

There is a little known peak of the Eastern Ghats situated in the extreme south of the Cuddapah district of the Madras presidency, in Lat. 13°-40′-45″, Long. 78°-28′-30″, which would appear a sufficiently interesting ground for a naturalist to bring to the notice of the Bombay Natural History Society; and I am happy to be able to do this and, at the same time, afford a little information about a very beautiful and uncommon bird, the Yellow-throated Bulbul (*Pycnonotus xantholæmus*) which occurs there.

The peak is called Horsely konda (Horsely's hill) after a member of the Indian Civil Service who built the present Forest bungalow and laid out its pretty grounds, and, generally brought the cool breezy hill top to notice as a local hot-weather resort. The height runs up to 4,000 ft. above sea level. From the presence of a temple on the summit, traces of a rude fort wall and remains of a paved track leading up the hill, as well as one or two tanks for the storage of water, the hill would appear, at one time, to have been of greater local importance than it is at present. It is now all included in reserved forest and as the water supply, though scanty at times, is sufficient and fairly distributed, the hill is a great resort in the hot season for the birds of the surrounding country, and must vie as such with any other on the Eastern Ghats.

I visited the little hill-top late in April last and, shortly after my arrival, I became aware of the presence of a bird with which I was unacquainted. I was not altogether surprised at this as I had already seen specimens of the Black Eagle (*Ictinaëtus malayensis*), the Ghat Nightjar (*Caprimulgus macrurus*), the Bay Banded Cuckoo (*Penthoceryx sonnerati*), and the Spotted Babbler (*Pellorneum ruficeps*). None of these are very common birds although the last mentioned would appear to have a more extensive distribution than Blanford would lead us to suppose. Also, later, on the evening of the 29th May, we heard the English Cuckoo (*Cuculus canorus*). I call it the *English* Cuckoo because it is so intimately associated with so pleasing a side of English life, but I myself have heard it between such wide ranges of latitude, conditions and climate, as the desolate and wind-swept Lang Fjeld in Norway which if not actually within the Arctic circle must be very near it, and the oppressively hot jungles of the Meduck and Warangul districts in the Hyderabad Dominions. Its occurrence so far south as Horsely konda must surely be almost a record? We were all much pleased to hear it.

It was only at the expense of some little trouble combined with good fortune that I succeeded, on the 29th April, in obtaining a specimen of the yellow throated Bulbul. The bird is exceedingly shy and restless. No sooner does the eye light on it than it is gone, and its flight takes it sufficiently far away to discourage ideas of following it up. I secured my first specimen from the verandah of the little Mission bungalow in which I was residing. Later, on the 20th May, I secured another specimen, but by then more birds had arrived, evidently to nest, and at the end of May they were not uncommon on the hill.

The specimens I obtained, tallied exactly in dimensions and markings with Oates' description. The irides are brown.

The bird frequents the upper part of trees and its presence is readily detected by its note to which it is constantly giving utterance. This, which is a very pleasing note, whilst readily recognized as the note of a Bulbul, is louder and mellower than that of any other Bulbul I am acquainted with. The birds go about in pairs and, once up the hill, seem to take up their quarters in some chosen spot where they are usually to be found; large boulders shaded by trees being especially favoured.

On the 15th May, whilst returning from a stroll in the jungle with the Rev. W. Howard Campbell, whose name is, I believe, well known to the Society, I found a nest of this bird. It was placed on the ground amongst dead leaves and between two over-arching granite boulders. We were in thin jungle on a sloping hillside. My companion, who is better up in the nesting of Indian birds than I am, was not a little astonished at seeing a Bulbul's nest on the ground. We retired some distance and watched the bird's return, and I subsequently observed the bird on the nest. It was a very ordinary Bulbul's nest containing three eggs much like the eggs of other species of the Bulbul family. They measured 83″ by 67″.

On the 20th May I found another nest containing two eggs. This was placed in a dwarf date palm (*Phœnix humilis*)—a common feature of the vegetation of our hills of this altitude in Southern India—on a fairly open hillside. On this occasion also I made sure of the bird by watching its return and observing it in the nest.

Horsely konda would seem to be a great nesting resort at this time of year. In the small compound of the house I occupied I found nests of the Common Green Barbet (*Thereiceryx zeylonicus*), the Coppersmith, the Magpie Robin, the Common Pied Bush-Chat, the Large Grey Babbler (*Argya malcolmi*), and the Madras Red-vented Bulbul. A patient search would, I believe, have rewarded me with nests of the Spotted Babbler (*Pellorneum ruficeps*) and the Small White-throated Babbler (*Dumetia albigularis*). We did, elsewhere in the hill, find nests of *Dicrurus cærulescens*, the Large Cuckoo Shrike (*Graucalus macii*) and the Paradise Fly-catcher (*Terpsiphone paradisi*) and Mr. Campbell found a nest of *Pellorneum ruficeps* containing 3 eggs. Doubtless the foliage on the hill, combined with the want of it elsewhere, and the comparative seclusion of the forest, are the main attractions. In any case the birds assembled there in considerable numbers and afforded us much interest.

I have much pleasure in sending the first nest found together with the eggs and two specimens of the bird to the Society's museum. I have to thank Mr. Campbell for kindly curing the skins of the birds.

P. ROSCOE ALLEN.

BELLARY, *6th June* 1908.

[Since the above was received from Mr. Roscoe Allen, a previous note on the same bird by Col. C. L. Wilson, R. A., dated Mhow, C. I., 19th May 1906 has been found. This note had been mislaid and runs as follows :—

"Referring to No. 802, *Pycnonotus xantholæmus* the following is my note from my diary :—

> "Shot and identified one of these Bulbuls at Bellary, Madras, on 18th June 1901. I noticed quite 20 pairs frequenting the rocky hills. Took a nest of Bulbul on 23rd June 1901, 2 eggs much incubated, only one preserved. Shallow nest of very coarse twigs—bound together with cobwebs and lined fine fibres—the whole a heavy, clumsy, structure quite unlike an ordinary Bulbul's nest. The 2 eggs it contained were white with a very slight gloss—blotched and marked with purple and brick red, the markings forming a very decided ring round the larger end."

I took these Bulbuls at first for No. 805, *P. luteolus* until I shot a specimen when the species was beyond doubt, yellow throat and yellowish green crown, see Key, p. 280, Vol. I., *Birds, Fauna of B. I.*

Subsequently a clutch of 3 eggs was brought to me purporting to be No. 802, but they are doubtful, as I did not see the parent bird. From my observations, early June and July would seem to be the breeding season.—C. L. WILSON.—EDS.]

No. XI.—NESTING OF THE SPOTTED-WINGED GROSBEAK (*MYCEROBAS MELANOXANTHUS*) IN THE MURREE HILLS.

I am writing to record in the Journal the finding of the nest and eggs of the Spotted-winged Grosbeak (*Mycerobas melanoxanthus*) in this place two days ago. Col. Rattray does not mention the bird in his "Birds nesting in the Murree Hills and Gullies" in Vol. XVI., Nos. 3 and 4 of the B. N. H. Society's Journal, and as there is no description of the nest and eggs in the *Fauna of British India*, the following may be of interest :—

Nest was in a Yew tree about 15 feet from ground on side of a steep hill, built on a branch towards the end, composed of a base or platform of twigs from the silver fir (*Abies webbiana*) on the top of which was a cup-shaped nest of moss laid with maiden hair stems and fine roots ; diameter of nest 3½", depth 1¾″, internal measurements. The outside of the nest was lined with some green stuff which remained green and did not dry up, which aided its concealment and is worthy of note I think. I sent the man I employed (who had been lent me by Col. Buchanan) up the tree and the bird remained sitting till he came right up to the nest. We waited for ten minutes or quarter of an hour when the male bird turned up and having a good look at him flew away; the female came soon afterwards and I shot her close to the nest and not being prepared for this species I did not recognise her. There was a full clutch of 3 eggs which are marked in the same way as that of the Black and Yellow Grosbeak (*Pycnorhamphus icteroides*) with streaks and blotches, only the markings are decidedly more reddish brown: the ground colour of the eggs is light green: the eggs were quite fresh.

Size 1·08 by ·8 inches.
1·07 „ ·84 „
1·07 „ ·8 „

The nest was found building by my searcher about 10 days ago when we were working in nullah, height 8,000 ft. At the time of taking the eggs Major Magrath, 51st Sikhs, was with me and has very kindly skinned the bird for me which I will send to the Society when dry.

I should be glad to know if these eggs have ever been taken and recorded before?

R. B. SKINNER,
Capt., R. E.

DUNGA GALI, N.-W. F. P., 24*th June* 1908.

No. XII.—THE QUETTA ROSE FINCH (*ERYTHROSPIZA OBSOLETA*).

At pages 520 *et seq.* of Vol. XVIII, of our Journal the "Report of the Baluchistan Natural History Society" is republished. In this, a note appears on *Eryshrospiza obsoleta.* I was one of the first persons to record finding the nest and eggs of this bird, but, through error, reported it as Hume's Hawfinch (*Coccothraustes humii*). I was led astray by accepting Captain Marshall's identification. In this I was foolish as the eggs were not Hawfinches, but typically *Erythrospiza.* Mr. Stuart Baker pointed this out to me, and, at his suggestion, I visited the Museums at Kensington and Tring, when I came to the conclusion that he was right. I wrote to the Quetta Museum on the subject. Mr. Cumming very kindly sent me a skin of the bird, which he had identified correctly, as well as discovered my error, which he brought to notice in the above quoted proceedings. I would ask all my friends, to whom I have sent clutches of the above eggs, to kindly accept my apologies for having misled them. My *Coccothraustes humii* is *Erythrospiza obsoleta.*

R. M. BETHAM, LIEUT.-COLONEL,
102nd (K. E. O.) Grenadiers.

MHOW, C.I., 28*th June* 1908.

No. XIII.—BREEDING OF HODGSON'S MARTIN (*CHELIDON NEPALENSIS*) AND THE RED-BILLED CHOUGH (*GRACULUS EREMITA*).

I have been on the look-out round Naini Tal for several years for the nests of *Chelidon nepalensis*, a resident species apparently, and last December while taking a Lammergeyer's nest we were overjoyed to see a vast number of mud nests on the cliff and a good number of *Chelidon nepalensis* hawking round them. The nests were mostly in inaccessible places, but after a prolonged survey we decided that some of the lower nests might be got at. So on April 3rd we went with ropes and long bamboos but found to our horror that twelve enormous bees' nests were scattered about among these lower nests making it quite impossible to attempt them. Very high up however there was one small new colony free from bees and although it seemed impossible to get at them. my men by climbing up to a narrow ledge, drawing up bamboos and lashing them together succeeded in reaching this small colony of about twenty nests; it was a fine feat of climbing and our grief was great when we found nearly all the eggs too hard-set to blow and only eight of them were saved. I think we should have been a fortnight earlier. I calculated there were over 3,000 nests in sight, there being three main colonies of about seven hundred nests in each and many smaller colonies. The nests were in masses touching each other, mostly under overhanging cliffs but in some cases they were exposed to the weather and the foot of the cliff was covered with a debris of fallen nests and droppings to a depth of several feet. The nests and eggs resemble almost exactly those of the Kashmir Martin (*Chelidon kashmiriensis*); the elevation is about 4,500 feet above sea-level. I had not expected to find them breeding so low down.

The Red-billed Chough (*Graculus eremita*).—I was fortunate this year in getting the eggs of the Chough from a nest in a cave at about 12,000 feet in Garwhal that I discovered some years ago. The four eggs were very hard-set on April 22, they measure 1·65 by 1·12 inches; the ground colour is greyish white and they are pretty thickly speckled all over with two shades of slightly yellowish brown and pale purplish grey; they are very like the egg of the Chough (No. 214) as figured in "British Birds with their Nest and Eggs", and are not unlike some eggs of the Common Magpie but are of course very much larger.

S. L. WHYMPER.

JEOLIKOTE, 12*th July* 1908.

No. XIV.—FLORICAN SHOOTING IN KATHIAWAR.

In India four species of bustard are obtainable, *viz.*, the great Indian bustard (*Eupodotis edwardsi*), a fine bird to be met with in suitable haunts throughout India, Sind excepted: the houbára (*Houbara macqueeni*), practically confined to Sind; the lesser florican or likh (*Sypheotis aurita*), to be found in Peninsular

India ; and the Bengal florican (*Sypheotis bengalensis*), which replaces the last named in Northern India.

In this article it is proposed to deal with the lesser florican, the smallest of the four, which is about the size of an ordinary barndoor fowl. It is of a lighter build, and has a longer neck, and legs in proportion to its size. The male and female have the same colouring, *viz.*, brownish or yellowish, with dark brown or black bars on each feather ; but the male assumes a nuptial dress, when he is easily distinguishable from the female. At this season his whole head, neck, and breast become a glossy black, a patch of white feathers appears on his wings, and five or six long feathers, terminating in " eyes," forming ear tufts, develop. He is then a most comely and beautiful bird. The female is perceptibly larger than the male.

I have shot florican in Rajputana, but Kathiawar is the district in which I have had best sport. It occurs in Central India, the Dekhan, and other parts of Bombay, but I have not had any shooting of this description in those parts The florican arouses one's curiosity, as it is a mysterious bird. During the monsoon--that is, from the latter end of June to August or September—it is numerous, not to say abundant, in Kathiawar, where numbers fall to the gun. At other times of the year it is rarely, if ever, seen. I have spent some twenty-four odd years in India, and have always been interested in ornithology, but I have discovered little about this bird ; nor have I met any sportsman who has ever made a bag of them, except during the monsoon. An odd bird or two may be met with occasionally ; that is all. Their coming and going is equally mysterious. Not a bird is to be seen ; the south-west monsoon sets in. In a few days your shikari comes in and reports, " Khurmor [florican] dekha, sahib" (I have seen florican, sir.) Sure enough, there they are, but whence have they come, and whither do they go ?

Grass lands, known as " bhirs" or " kurans," interspersed with low bushes jowari and millet fields, and such like, form the haunts of florican. During the hot weather these are arid plains, but very little rain brings up the grass, and with the grass comes the florican. However, every bhir will not hold birds. To the ordinary eye two bhirs may look exactly alike. One will attract florican, the other will not. In all probability it is a question of suitable food being obtainable. To be sure of getting birds one must engage a shikari who knows their favourite haunts, else it is of no use, for one may wander for miles over likely looking ground and not flush a bird. Another thing to know is that a certain bit of ground will only accommodate a limited number of birds. You may leave it for ten days or a month, but there will only be about the same number of birds as you have already taken off it. Instinct seems to warn them that a bit of ground can only maintain a certain number, so any others coming along must pass on.

Florican only being about during the breeding season necessitates their being shot at that time. This does not seem to diminish their numbers ; nor do I think much harm would be done if hens were always spared. Fortunately about 80 per cent. of the birds shot are males. There can be no doubt about this, for they are as distinct from each other as the wild duck is from the mallard. Florican have very peculiar habits. I do not think they pair, or that they are polygamous. They would appear to go in for polyandry, if one can apply such a term to birds. In the breeding season the males have a most peculiar custom of leaping several feet in the air, at the same time uttering a call very similar to two sticks hit rapidly together or the croak of a frog. This is done with a view to attract the females. The latter come to the males for the purpose of mating, but once eggs have been laid and incubation has commenced there appears to be no companionship between them; therefore it does not matter if the males are shot.

Fortunately florican are of a very skulking nature, and are difficult to flush. A female is rarely put up, and the males only betray themselves by their antics while love-making, which enables them to be easily marked down. But for this, I fancy they would be as difficult to find as the females. A florican is not a difficult bird to shoot, unless you give him a chance by missing him the first time he is flushed. In such a case he will fly some distance, and will either get up just out of range or let you pass over him, or do something equally annoying. To bring him to bag will then probably entail a good deal of walking and patience. As a rule he gets up within easy range, and flies, very slowly, straightway. One pellet seem sufficient to bring him down. I have seen some marvellously long shots made at them. In spite of this there is an indescribable charm about florican shooting. I think it is because it comes in with the monsoon, which puts an end to the long hot weather, brazen skies, hot winds, closed doors, and the like. There is no more welcome sound than that of the rain; it refreshes the earth, which gives off that delightfully earthy smell, fills wells and rivers, makes a rushing stream of a dried-up nullah, gives hopes of cool nights and days, and of fodder for cattle, and a hundred other benefactions for mankind in general. I know I always looked forward to it, as it meant cloudy days, and being able to be out at any and all times.

I will now give an account of a typical day's shooting. Your shikari having reported that he has marked down a certain number of florican, you arrange to go out on Thursday, always a brigade holiday in India. An early start must be made, in order to reach the ground betimes, for once it begins to get warm florican cease "jumping," when it is difficult to find them. The country cart tracks are usually very poor indeed, and almost impassable in parts. I usually made use of a district or shikar tonga, as I preferred it to riding a long distance. This trap was just suited to the roads it had to cross; in fact, it would go over almost any road (except, perhaps, Piccadilly !). Another advantage of this conveyance was that there was room for one tiffin basket and drinks in it. Having completed arrangements, an early start is made, and the shooting ground is reached shortly after daylight. Here the shikari meets you and informs you that he has five birds marked down. Coolies are engaged to be out in the "bhir" at streak of dawn so as to be able to locate the male florican as soon as he begins jumping. The tongawallah is given instructions where to take the tonga and tiffin basket for your midday meal, and you start off after the nearest marked bird. On your way he is probably heard calling and then seen jumping. You draw closer and closer between the jumps, till the bird rises and flies straight away, only to be bagged at the first shot. This is satisfactory. You then proceed to the next bird, but he is not quite so easily got. Something disturbs him, and he gets up rather unexpectedly and with a long rise. Knowing that they are easily brought down, you blaze at him, but without success. He is then watched, and the place where he has settled is marked. You trudge some 500 or 600 yards after him. You are not quite sure of the exact spot. While searching round he again gets on the wing out of range, and is marked down once more. The same procedure is then followed until he is bagged or flies off a very long way. The next bird on the list is then taken in hand. On the way it is quite possible that an unmarked bird is put up and accounted for, or otherwise. All this takes time, for one has to get from one place to another. After all marked birds have been diposed of, a line is formed and the "bhir" beaten out on chance, when a hare, quail, or partridge may also be accounted for. As these latter birds are breeding at this season they should be spared or at any rate not shot in large numbers.

Lunch is taken about 1 p.m., after which it is usually a case of home. I have on two occasions got seventeen florican in a day ; twelve or thirteen were considered very good, eight or nine satisfactory, while anything below that number did not please. I believe in days gone by very large bags were made, but I was quite satisfied with the above. I have not heard of late whether these birds are as plentiful now as they used to be in my day, some twenty years ago.

The florican, like all bustards, lays a large round apple-green egg dashed with rusty red, which is placed on the ground in a depression, no attempt at a nest being made. Four eggs would seem to be the full complement. As a table bird the florican is considered a delicacy, but when the Spanish or blister fly (*cantharides*) is in season he should be eaten with caution, as he is very partial to that insect as food.

(*From* "*The Field*," *May 2nd*, 1908.)

No. XV.—NOTES ON BIRDS IN THE AMHERST DISTRICT, LOWER BURMA.

I think the following worth recording in the Journal :—

1. Last year when coming over the Dawna range in this (Amherst) district I found *Cerasophila thompsoni* at about 3,500 feet. I lost my one specimen then obtained, but this year almost at the same spot I found the bird again and have to-day posted a skin to our Society.

2. On the 25th April 1908 while rafting down the Thaungyin river I saw a Hobby (*F. severus*) disappear into the cleft of a giant tree on the Siamese

bank. Next day although it was 12 miles from camp, I trusted to luck and went back with some Burmans prepared to scale the tree. It took us two hours to get up the necessary 66 feet, as there was not a branch below the cleft, and pegs had to be driven into the bark at each foot and a half, but I was amply repaid by finding 2 eggs in the nest. I shot the birds to make sure of my identification and send you the skins of the pair of Hobbies. The eggs were laid in the cleft of the tree simply on the slight accumulation of refuse that had gathered there. There was no nest, and this seems to be the general habit, because on a former occasion, although then in a hole in a cliff on the Myittha river, as recorded on page 518, Volume XVI of this Journal, there was no nest. The eggs are of the ordinary falcon type. The shell strong and rough. The ground colour is a dirty white and one egg is washed a good deal more than the other with reddish sepia, thicker and more in blotches at the big end. They measure 1·56 × 1·19 and 1·55 × 1·23.

K. C. MACDONALD.

MOULMEIN, 20*th May* 1908.

No. XVI.—THE CUCKOO (*CUCULUS CANORUS*).

This bird is very common on the ghats in the vicinity of Mhow. On my birds' nesting expeditions lately, I have heard it call constantly, and seen it flying about singly and in pairs. I have not, however, obtained any eggs at present though I hope I may. I merely report this, as the Vindhyas are not mentioned as one of its haunts in the "*Fauna of British India.*" I have not heard it anywhere near the station but out in the jungles, which are nowhere nearer than five or six miles. I constantly heard the Cuckoo on the hills round Quetta, when last stationed there.

R. M. BETHAM, LIEUT.-COL.,
102nd (K. E. O.) Grenadiers.

MHOW, C. I., 18*th July* 1908.

No. XVII.—THE BEARDED VULTURE OR "LÄMMERGEYER" (*GYPAËTUS BARBATUS*).

Judging from his note on *Gypaëtus barbatus* on page 500, Vol. XVIII of the Journal, General Osborn appears to have accepted, as fact, the general fallacy with regard to the killing powers of the Lämmergeyer. A glance at his nest and its environments is apt to raise the bird considerably in one's estimation as a mighty hunter, as therein may be found a miscellaneous collection of all kinds of bones, from a shin bone of an ox to that of a muskdeer or a tiny lamb, but how many of these are the result of his own killing? Not one, I fear, unless it be the latter and that even doubtful. I have more than once seen a Lämmergeyer breaking bones, and the way he does it is to soar up about 300 feet from the ground and drop the bone among boulders. I watched one in Kashmir for the better part of an hour, and during that time the bone must have been dropped quite 50 times, but still remained unbroken, when I left the place ! That Jerdon found large bones and the hoof of an ibex, inside a Lämmergeyer, is no proof that the bird had killed the sheep, and the same applies to the hair and fractured shoulder blade of a ghooral, found by General Osborn. I have twice seen a Lämmergeyer picking out tit bits from the remains of a panther's kill, and it is not an uncommon sight to see one waiting close at hand, or circling over a carcase at which vultures are making merry. Though he does not often fraternize with them, he is none too proud to select bones from what remains of their feast, after the vultures have left. Nearly all birds of prey which do their own hunting use their hind talon most for striking their prey, and one glance at the comparatively weak, though enormous, foot and small blunt talons of a Lämmergeyer precludes all idea of the possibility of his being able to hurl anything approaching the size and strength of a ghooral, much less an *Ovis ammon* over a cliff. *Aquila chrysaetus*, the Golden Eagle, of all birds of prey, is the only one capable of such a feat and compare his enormous foot and talons with those of a Lämmergeyer. I have sent specimens of both birds to the Society's museum, and the Editor can see and judge for himself.

In captivity the Lämmergeyer rarely attempts to use his claws as a means of defence or offence and much prefers biting. Whereas the Golden Eagle will seldom attempt to bite, but will shoot out its foot at every opportunity and woe betide anything that comes into its clutches.

I have a tame eyass with me now and know what his grip is, even through a very thick and hard cow-hide gauntlet, even though he is a youngster only just beginning to fly.

C. H. DONALD, F.Z.S.

BUSHAHR STATE, SIMLA DISTRICT,
23rd *July* 1908.

No. XVIII.—MATERNAL SOLICITUDE.

With reference to Major Begbie's article, on page 680 of Vol. XVIII, "On the Habits of the Bengal Red Whiskered Bulbul," it may be of interest to some of our members to learn that lapwing, plovers and bulbuls are by no means the only birds which simulate broken wings or legs, to delude the uninitiated into following them and so getting away from the nests. Doves generally, but the little spotted dove in particular, is a past master in the art of feigning a hurt wing. I have also seen the Indian Grey Shrike (*Lanius lahtora*) play the same game, but not quite so well as a dove, and the other day I was not a little surprised at seeing a black partridge, which took me in completely for the minute, rise about 2 ft. out of a patch of grass, and fall back sideways. The bird could not have done it better had it really had a broken wing, but very nearly paid dearly for its maternal solicitude on this occasion, as a setter of mine made a rush forward and only just missed it by inches before I had time even to call. As the mother flew off I looked about and there sure enough was a brood of tiny chicks running about the grass. I had three dogs with me so had to beat a hasty retreat calling them after me. A woodcock, too, will go flapping along the ground when her nest is approached, but I do not remember ever seeing any other game bird do so, though I have frequently come across nests of monal, koklass and kalij pheasants. The former, when with chicks, will often run along ahead of a dog taking short flights of a few feet, when it gets too near, but never have I seen her actually simulate a broken leg or wing or even flap along the ground, like a woodcock.

C. H. DONALD, F.Z.S.

BUSHAHR STATE, SIMLA DISTRICT,
20th August 1908.

No. XIX.—AN ADDITION TO THE INDIAN AVIFAUNA. THE MALAYAN HAWK-CUCKOO (*HIEROCOCCYX FUGAX*).

Amongst a number of skins sent to me from South Tenasserim to be identified is a perfect skin of the Malayan form of the small Hawk-Cuckoo. The skin sent is that of a male, shot on the 27th January 1908. This little Cuckoo is very closely allied to our Indian bird *H. nanus*, the small Hawk-Cuckoo, and replaces it in Malaya and possibly in the extreme south of Burma, though this is the first specimen yet thence. *Hierococcyx fugax*, the Malayan Hawk-Cuckoo, extends throughout Malaya, the Bornean Islands, south and South-East Central China, and has been found by Alan Owston breeding as far north as Japan.

It has been generally accepted that this Hawk-Cuckoo is resident wherever found but this is not yet proved though quite probably the case. It differs from our bird principally in having a proportionately much larger bill, but is otherwise very much the same.

E. C. STUART BAKER, F.Z.S., F.L.S.

SHILLONG, *21st August* 1908.

No. XX.—THE OOLOGY OF PARASITIC CUCKOOS.

In the last number of our Journal, No. 3 of Vol. XVIII, page 681, Mr. C. M. Inglis has a note on the identification of certain Cuckoos' eggs taken by himself and Mr. A. M. Primrose on the nests of *Æthopyga seheriæ*, the Himalayan Yellow-backed Sunbird. This letter was written prior to the publication of my "Additional Cuckoo Notes" which appeared in No. 2 of the same Volume and Mr. Inglis will have seen from that, that it has been proved beyond all doubt that some at least of these eggs are those of *Chrysococcyx maculatus*, the Emerald Cuckoo.

As I mentioned in the above article the young Cuckoo, which was taken by Mr. Primrose from the Sunbird's nest and brought up until fully fledged, was sent to me for identification and proved to be a young Emerald Cuckoo. At the same time it is quite possible, even probable, that some of these eggs may have been laid by *C. xanthorhynchus*, the Violet Cuckoo.

The identification of these beautiful little Cuckoos is, with the exception of fully adult males, an extremely difficult matter when they are seen only on the wing or high up in trees. Nor is it possible, I should think, to identify them by their calls. Therefore though Mr. Inglis obtained *one* specimen of the Violet Cuckoo, many of the others which he saw and heard in the vicinity of the Sunbird's breeding haunts may have been Emerald Cuckoos.

E. C. STUART BAKER, F.L.S., F.Z.S.

SHILLONG, 21*st August* 1908.

No. XXI.—INDIAN DUCKS AND THEIR ALLIES.

In the newly published volume on this subject by Mr. Stuart Baker, he seems to have omitted to mention two records of the Clucking Teal (*Nettium formosum*) which were got in India. Finn in his useful little book "How to know the Indian Ducks" on page 89 mentions having got a female Clucking Teal in the Calcutta bazzar in the cold weather of 1898-99 and Mr. M. Mackenzie of Rajaputtee, Chuprah, obtained a male in the Sarun District. These have evidently been overlooked by Mr. Stuart Baker.

I might also mention that the cold weather before last a Marbled Teal (*Marmaronetta angustirostris*) was brought here by a Mirshikar but unfortunately it got away while the man was showing it to me. I am quite certain of the identification as I know all our Indian ducks.

CHAS M. INGLIS.

BAGHOWINE FCTY., LAHERIA SERAI,
5th September 1908.

No. XXII.—THE INJURY-FEIGNING HABIT OF PARENT BIRDS.

I have read with much interest Major Begbie's account on page 680 of Vol. XVIII of this Journal, of the imitation by a Bengal Red-whiskered Bulbul of a badly-wounded bird in order to distract attention from its young. I should like to offer a few remarks on this subject in view of the closing paragraphs of Major Begbie's note:—"The simulation was perfect, and it is interesting to speculate how the bird acquired its knowledge of how a badly-wounded bird would behave! The whole occurrence seems to me to point to reason rather than instinct—though I am aware that I tread on delicate ground in saying so."

In my opinion the action is purely instinctive. In the first place it is to be noted that the parent birds at first contented themselves with scolding. It was only later—"after a few seconds"—that one of the bulbuls feigned injury. Now, does not this seem rather like "locking the stable door after the steed has been stolen?" Had the action been purely intelligent, one would have expected it to have taken place immediately Major Begbie and his friend came upon the scene and not after they had time to obtain a view of the young birds.

We are, in my opinion, too prone to put anthropomorphic interpretations on the actions of animals, to judge their doings by human standards.

In order to show how some seemingly most intelligent actions of birds are really instinctive, I should like to reproduce an account of a little incident I recently sent to the *Madras Mail.*

"Some time ago, while walking near the golf links at Lahore, I noticed a rat-bird or Common Babbler (*Argya caudata*), to give it its proper name, with a green caterpillar hanging from its beak. The succulent insect was, of course, intended for a young bird in a nest near by. Being in no hurry I determined to find that nest. Under such circumstances, the easiest way is to sit down and wait for the parent bird to indicate the position of the nursery. The bird with the caterpillar had seen me, so, instead of flying with it to the nest moved about from bush to bush uttering his or her note of anger (I do not pretend to be able to distinguish a cock from a hen rat-bird). In a few minutes the other parent appeared on the scene, also with something in its beak. Observing that all was not well, it too began 'to beat about the bush,' or rather from one bush to another. Meanwhile both swore at the ungentlemanly intruder. However I had no intention of moving on before I found that nest. After a little time the patience of the second bird became exhausted: it flew to a small bush into which it disappeared, to reappear almost immediately with an empty beak. I thereupon advanced to that bush of which the top was not three feet above the ground. In the bush I found the neatly constructed cup-shaped nest which contained five young rat-birds. I handled these, taking one ugly naked fellow in my hand in full view of the parents who were scolding vehemently. I was careful to make certain that the mother and father could see what I was doing, for I was anxious to find out how far their laudable attempts at the concealment of the nest from me were due to the exercise of intelligence. Having replaced the baby bird in the nest, I returned to the place where I had waited for the parents to direct me to their nursery, and watched their future actions. If they had been acting intelligently, they would have reasoned thus:—'The great ogre has found our nest and seen our little ones. If he wants them we are powerless to prevent him taking them. The game of keeping their whereabouts hidden from him is up. There is nothing left for us to do but to continue to feed our chicks in the ordinary way without further attempt at concealment.' If, however, they were acting blindly merely obeying the promptings of the instinct which teaches them not to feed their young ones in the presence of danger, they would be as unwilling now to visit the nest as they were when they first caught sight of me. They pursued the latter course, thus demonstrating that this seemingly most intelligent behaviour is prompted by instinct."

To return to the injury-feigning habit.

Some birds feign injury when there are eggs in the nest, and by so doing direct attention to the fact that they have a nest. Mr. Edmund Selous in his *Bird Watching* states that he has observed the snipe, the Arctic Skua and the nightjar act thus when they have eggs.

Similarly most people have heard the noise which all bulbuls make when anyone approaches their nest ; they do this whether it contain eggs or young ones. Now, the making of such noise must tend to be harmful since it attracts attention to the nest which might otherwise pass unobserved. We know that at the nesting season birds are in a very curious mental state. Were they not, they would not sit for hours warming their eggs.

No bird can possibly be acting intelligently when sitting on its first clutch of eggs ; it cannot know that they are going to yield young birds. Thus at the nesting season birds are seized by a kind of mania. In such a state their mental balance is easily upset, hence they perform strange antics when a dangerous animal approaches the nest. These antics are the outward expression of the fact that they have temporarily lost their mental balance. Such actions tend to preserve the young birds by distracting attention from them, natural selection will favour those animals which display this characteristic in the most marked degree, but such actions could be harmful where there are eggs in the nest, and being harmful would tend to be weeded out by natural selection. other words natural selection would operate so as to preserve those individuals in which the mental balance is more easily upset after incubation than during incubation.

I would recommend all who are interested in this subject to read pages 59 to 66 of *Bird Watching*.

Mr. Selous is of opinion that such actions were originally instinctive, but he thinks that in certain instances, notably in the case of the wild duck, the actions of the mother bird are blended with intelligence. He suggests that natural selection has not only picked out those birds who best performed a mechanical action which, though it sprang merely from mental disturbance, was yet of a beneficial nature, but also those whose intelligence began after a time to enable them to see whereto such action tended and thus consciously to guide and improve it.

This view appears plausible, but I do not think it is correct. It appears to me to be both unnecessary and unlikely. Most of the actions of birds in the vicinity of the nest, including nest building, are instinctive,* and it does not seem probable that, in the midst of all these automatic actions, an exceedingly intelligent act should be implanted. But the subject is a difficult one and I have therefore no wish to attempt to lay down the law thereon.

If any members of the Society have recorded observations which throw light on the subject, I trust they will let the Society have the benefit of them.

D. DEWAR.

LOWESTOFT, ENGLAND, 10*th September* 1908.

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* This I have endeavoured to demonstrate in an article which appeared in *The Albany Review* for August 1908.

No. XXIII.—A NEW COLOUR VARIETY OF THE COMMON GREEN WHIP-SNAKE (*DRYOPHIS MYCTERIZANS*).

Our Society has recently acquired a very interesting specimen of the Common green Whip-snake (*Dryophis mycterizans*) from Major H. Delmé-Radcliffe, collected in Shwebo, Upper Burma. The specimen is peculiar in the colouration of the belly which is bright rosy tint between the white lateral ventral lines. Otherwise the snake accords in colour, and lepidosis with typical specimens. I propose to call it variety *rhodogaster*. The ventrals are 191. *Subcaudals* ? Tail imperfect. *Costals* 2 headslengths from head 15, midbody 15, 2 headslengths before vent 13. This latter is unusual, the rows usually coming to 11 at this situation, however I have had other specimens of variety *typica* from Burma numbering 13. In variety *typica* the belly is a light emerald green, and in the variety I have lately alluded to as *cinereoventer*, it is ashy grey.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

DARJEELING, 20*th July* 1908.

No. XXIV.—FLYING SNAKES.

The following extract from my diary may be of interest in connection with Major Wall's interesting remarks *re* "flying snakes" published in the last Journal, Vol. XVIII, pp. 239—243.

"ETAWAH, 7*th August* 1903.—Visited the Fisher Forest Reserve rented by Messrs. Cooper, Allen & Co. of Cawnpore. . . . . . I found a young *Echis carinata*, a foot long, curled up into a figure of eight, and resting on the finest twigs at the extreme end of a babul branch, 5 feet from the ground. I killed him and skinned him. My orderly, who was with me, tells me the natives call it the *Urnawalla sanp*, which signifies 'the flying snake.' He says "it can spring from tree to tree, and from a tree on to its quarry." The above mentioned orderly was an extremely intelligent man, and with quite an unusual 'shauq' for natural history. Unfortunately I was not aware at the time that snakes were credited with these springing powers, otherwise I would have tested them before killing this particular one, and would have questioned the man more closely. As it was, his information came too late for practical demonstration, and was then regarded by me as merely "folk-lore"!

ARUNDEL BEGBIE, Major,

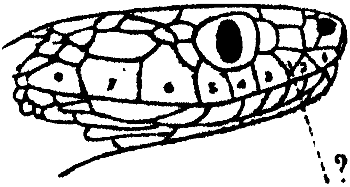
LUCKNOW, 7*th May* 1908.

ORMAL SCALES IN THE SNAKES *ZAMENIS* AND *DIPSADOMORPHUS TRIGONATUS*.

In his article on the Common Indian Snakes (Vol. XVII, No. 2, page 262) Major F. Wall says about *Zamenis mucosus* that it has 3 loreals normally,

" Occasional aberrant specimens may be seen with only 2 loreals or even with 4 or 5." In a young specimen in my possession there are *two* loreals on the right side and only *one* on the left. Is not this very extraordinary ?

Again, in a specimen of *Dipsadomorphus trigonatus* the shields on the right side are normal, whilst on the left side there is a small wedge-shaped shield between the 2nd and 3rd supralabial. It touches the squarish loreal and also the supraocular. Is it another loreal ?



J. P. MULLAN.

BOMBAY, 11*th August* 1908.

No. XXVI.—NOTES ON A GRAVID FEMALE OF SIEBOLD'S WATERSNAKE (*HYPSIRHINA SIEBOLDII*).

I have lately received from Mr. N. V. Reid a fine specimen of Siebold's watersnake, interesting especially in that it is a gravid female, containing 5 fœtus, and 7 nonfertile eggs.

It was found beneath a stack of wood about 20 yards from a lake on the 21st July this year at Champaran, Bengal (the extreme North-West District of Behar). The scale rows in the mother are 29 two-heads lengths behind the head, 29 in midbody and 22 two-heads lengths before the vent ; the ventrals and subcaudals 152×47. The lepidosis of the 3 young extracted from the membrane, all of which are females, is as follows respectively :—No. 1, scales 29—29—25, ventrals 148+47; No. 2, scales 29—31—25, ventrals 147+46 ; No. 3, scales 27—29—21, ventrals 143+?, tail deformed.

The length of one fœtus is 7½ inches, and they all have the appearance of being ready to be born.

Members of the family Homolopsinæ are all reputed to be viviparous in habit, but the fact that oviparous and viviparous species are to be found in the same genus (*Tropidonotus*, *Lachesis*, *etc.*) should deter one from making too sweeping assertions with regard to the breeding habits of other genera, and more especially of families. I am not aware of any previous record showing that this species is viviparous.

F. WALL, MAJOR, I.M.S., C.M.Z.S.

DARJEELING, 30*th August* 1908.

No. XXVII.—KRAITS IN INDORE.

In September last a case of death from snake bite occurred in Indore. The snake was a Krait, corresponding closely, as will be seen, with the description of the *Bungarus cæruleus* in Boulenger, from which it differs principally in the possession of 17 rows of scales. Major Wall cites this feature to differentiate the *Bungarus sindanus* from the *Bungarus cæruleus*; but of the *sindanus* he says that the first three supralabials are equally broad, that the ventrals are 220 to 237, that the colour of the snake is black with white cross-bars, and that the vertebrals are slightly longer than broad in the middle of the body. These four characteristics are all wanting in the snake in question. it is therefore not *Bungarus sindanus.* If the possession of scales in 17 rows is conclusive against its being *Bungarus cæruleus*, the only alternative left seems to be that it is *Bungarus walli.*

The full description of the snake (which we will call A) is as follows :—

Scales 17, vertebral scale broader than long.

Ventrals 198.

Sub-caudals 44.

Supralabials 7 (3rd and 4th entering eye). The second the only slightly narrower than the first, very much narrower than the third.

Præocular 1.

Postoculars 2.

Pupil of the eye apparently round.

Total length 3 feet.

Colouring.—Deep electric blue. Lower half of rostral and supralabials white.

Marking.—A series of white spots all the length of the vertebrals at irregular distances, but more or less ¾ inch apart. Two white spots in front of the eye on the præocular and 3rd supralabial. An arrangement of white spots tending upwards from the ventrals to the vertebrals giving the effect of a succession of small triangles, the base being on the junction of the scale with the ventral, and the apex about half way up to the vertebral.

Is this snake to be classed as *Bungarus cæruleus* or *Bungarus walli?*

With a view to ascertaining how many species of Kraits we have in Indore, I have re-examined two specimens, which have been in bottles for some years, together with two specimens which have been brought to me within the last fortnight.

Of the two specimens in bottles, the first, B, corresponds closely with A, the snake described above.

The second, C, has 15 scales, with the 2nd supralabial slightly narrower than 1 and 3.

Of the two, D and E, killed within the last fortnight, D corresponds with A and B, though the marking is more in the nature of regular transverse bars than in A.

E is as follows : —

Scales 17. Vertebral broader than long.

Ventrals 189. (There were probably more, but the snake had been badly damaged in three places breaking the continuity.)

Sub-caudals 50.

2nd supralabial slightly narrower than 1 and 3.

Length 2 ft. 2 in.

Colouring.—Mercurial black (the only one of the colour I have ever seen in Indore) with white bands, formed by white spots, crossing the body, but very sparse towards the head. The tail could hardly be said to be mottled underneath towards the tip, as indicated by Major Wall, but the colour might be described as dirtier.

In A, B, D, and E, a clearer distinction between the head and neck was discernible than in C.

I take C, therefore, to be a distinct variety from the others, probably *Bungarus cæruleus.*

A, B, and D are probably one variety. Query what? E, having regard to its colour, differs from A, B, D, and corresponds closely with the description of *Bungarus walli.*

Assuming that A is to be classed as *Bungarus walli*, of which Major Wall says that nothing is known about the poison, it will be interesting perhaps, if I give the symptoms that followed the bite, up to the time of death.

The victim, a man, was bitten while in bed There was a single puncture near the nail of the third finger. Ligatures were applied to the finger and arm within ten minutes; an incision was made and permanganate applied and the finger was kept in a saturated solution of permanganate for over an hour.

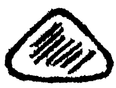
No ill effects of any kind manifested themselves for 2¾ hours, when vomiting began. Fifteen minutes after the commencement of vomiting, paralysis of throat and respiratory organs set in. Milk and brandy were given and swallowed, and strychnine injected hypodermically. From this point till the end the man was unable to speak. The pulse kept very strong. Paralysis of the throat became more and more marked. After 4½ hours a state of coma supervened, the pulse weakened, and death took place 4¾ hours from the time of the bite.

Since writing the above, I have examined a sixth *Bungarus* (F), just brought in. It is a fine snake, measuring 3 ft. 7¾ in. Tail 5¾ in. Ventrals 198. Scales 17. Sub-caudals 48.

It has all the general characteristics of A.

Colouring.—Head black, shading off to blue. One white (or rather yellow) spot on the præocular. Lower half of rostral and supralabials yellow, commencing at 11 inches behind the head, white transverse bands, regular as far as the end of tail, 47 in all, there is the same tendency to triangular formation on junction of scales with ventrals, which was recorded in A.

One more point remains to be noticed. Major Wall says in his book that the tail of the *Bungarus* is round. A cross section of this snake's tail half way between the anal and the tip would present this outline.



E. C. CHOLMONDELEY.

INDORE, C.I., 7*th October* 1908.

No. XXVIII.—SEXUAL ATTRACTION IN LEPIDOPTERA.

Referring to the Revd. W. Howard Campbell's note in the Journal (p. 511 of this Volume) on the "Sexual attraction in Lepidoptera" in which he records the capture of a male specimen of a Psychid moth, *Clania crameri*, that had been attracted to an unimpregnated female shut up in a tin box and contained in his pocket, it may interest him as well as others to know that in order to capture the males of certain species of Lepidoptera by "sembling," it is not always even necessary for the presence of the female.

I remember, some years ago, when out collecting with a friend in the South of England (we were then sembling for the males of *Saturnia pavonia minor*, The Emperor Moth, and had a few females tied up in muslin bags) that he told me of his experiences in "sembling" for the Oak Eggar Moth, *Lasiocampa quercus*.

He had been out on two consecutive days with an unimpregnated female of the Oak Eggar Moth sembling for males, and had carried the insect in a box in his satchel to and from the field of his operations. Having captured a sufficient number of males during the two days, the female insect was left at home when he went out collecting again on the following day. He took with him, however, the box that had contained the female Oak Eggar Moth, and was very surprised to find that males were attracted to him. These he caught but liberated again, as they were useless to him as specimens being somewhat worn. After some time it suddenly occurred to him that perhaps he had, after all, again brought out the female eggar moth, but on opening the box it was not there. To test his belief that the empty box still contained the power of attracting male moths, he placed it on the ground and stood some little way from the spot, to watch. Two male moths that had been flying round and about him, presently flew away but returned again shortly afterwards to flutter round the box itself These two moths were the only ones attracted which seems rather extraordinary, as there must have been others about, and for the reason that a fair number had been caught on the two previous days. I can only suppose, that so long as the man kept moving about, there was just sufficient smell from the box left behind him to attract any moths that he would be passing quite close to. A breeze blowing in a certain direction might have carried the scent from the box only a short distance and these two moths were the only ones just in that locality that received the benefit of it.

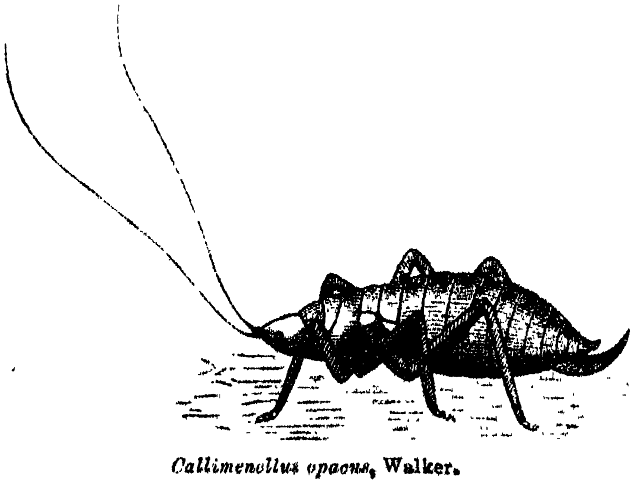
A few female moths are entirely apterous as in the case of the Psychidæ, others have wings of such a rudimentary form, as to be quite unfit for flight. In instances like this it is evident that the sexes would experience some difficulty in discovering each other unless they were in possession of some peculiar means for that purpose. But as is usually the case, when both sexes are winged, an introduction to each other is so necessary a step that it cannot be left to the chances of a casual encounter. The males, therefore, in certain species possess a wonderful acuteness in the sense of smell, or they have been endowed with some peculiar instinct (the nature of which is beyond our comprehension), by which they can discover the opposite sex at great distances.

CHAS. B. ANTRAM,
Entomologist, Indian Tea Association.

KANNY KOORY, SILCHAR,
15*th May* 1908.

No. XXIX.—A LARGE CRICKET (*CALLIMENELLUS OPACUS*, WALKER) FROM KHANDALLA, WESTERN GHATS.

For many years I have constantly come across these large brown Crickets at Khandalla when turning over stones or examining holes in the ground in search of snakes and lizards, but I had no idea that they might be of any scientific interest till our Secretary asked me for some information about them. Mr. T. R. D. Bell has recently obtained their identification at the British Museum and tells us that they belong to the sub-family *Phasgonuridæ*.



Callimenellus opacus, Walker.

In May 1906 we found many of our young trees at Khandalla completely stripped of their bark; we first suspected hares, but that suspicion was evidently unjust as even good-sized trees had their bark eaten off to a height which no hare could have reached without a ladder. My suspicion then naturally fell upon the Crickets which had multiplied in our compound to quite an unprecedented extent and the question was soon settled. I kept a few of them over night in a glass jar together with some green branches and found the branches next morning gnawed in exactly the same manner as our trees had been.

The habits of these pests are of course nocturnal. During the day time they hide away not in the holes dug by themselves like other respectable Crickets but in all possible places which they find ready made. They also hide themselves not singly or in pairs but in very large numbers closely packed together.

They have apparently very few natural enemies to contend with. Two of them would make a very fair meal for a musk rat but musk-rats are not very numerous at Khandalla and I know of no other animal which might be able and willing to keep down their numbers.

F. DRECKMANN, S. J.

ST. XAVIER'S COLLEGE, BOMBAY, *August* 1908.

No. XXX.—CLASSIFICATION OF LEPIDOPTERA.

With regard to Mr. Comber's query in the Journal as to the modern classification of Lepidoptera, the following remarks may be of value.

The most notable work now appearing on Lepidoptera is Sir George Hampson's Catalogue of *Lepidoptera Phalana*, published by the British Museum, of which 6 volumes have been issued.

Hampson therein propounds a new classification of Lepidoptera, based largely on venation, in which he treats the order as a whole; in his phylogenetic table, the 7 families of butterflies are shown to arise from the *Euschemonidæ* and to be connected through the *Castniadæ* to the moths; in his key to the families the butterflies are separated as having the "Antennæ clubbed or dilated, frenulum absent." The butterflies are in this sense alone regarded as a distinct group and the line of separation between them and the moths is no sharp or clear one; were the butterflies not day-flying, large and conspicuous, it is doubtful if they would ever have been separated at all, as there is no real ground for this separation on phylogenetic grounds.

If we accept Hampson's views as being the most accurate presentation of the relationships of the groups of Lepidoptera, the old groups such as Bombyces, Noctues, etc., disappear and we have a large series of the highest Lepidoptera represented by Syntomids, Arctiids, Noctuids, Hypsids, Sphingids, Geometrids, Bombycids, Saturniids etc., at one end, the butterflies at the other end, and a number of families between (such as Castniids, Lasio-campids, Limacodids, Cossids, Psychids ; all these rise out of Zygaenids, to which are linked a group comprising Pyralids, Tortricids, Sesiids, Tineids, the last rising with Hepialids out of Micropterygidæ. As a matter of working convenience, the butterflies, as represented by Nymphalidæ, Satyridæ, Erycinidæ, Pieridæ, Lycænidæ, Papilionidæ, and Hesperiidæ remain as a group but linked on closely to moths by families little represented in India.

Hampson's views are generally accepted in the main by English and American entomologists, and since we look to him for the Fauna of India volumes of moths we may accept his classification. For working purposes, it is useful to take four groups ; the butterflies as commonly accepted, the Microlepidoptera to include the families at the foot of the table (Zygænidæ, Pyralidæ, Pterophoridæ, Sesiidæ, Tortricidæ, Tineidæ are the most important) exclusive of Micropterygidæ and Hepialidæ, which we class separately, and leaving the bulk of moths as the group Heterocera.

With regard to nomenclature, it is to be feared that the synonyms will grow and increase so long as the main object aimed at is "priority" ; it is so easy to find that some older author figured or described a species universally known now by some later name and so difficult to get any two men to agree to the details of these priority changes. The classic case is Hampson turning our old friend *Heliothis armigera* into *Chloridea obsoleta*. and if Mr. Comber will attempt to correlate the names of the Sphingidæ in the *Fauna of India* Vol. I, with those in Jordan and Rothschild's Revision, adopted by Hampson in this Journal Vol. XV and XVI, he will find that he has no easy task and that purely on priority, the nomenclature is wholly changed and that to use modern literature and literature period to 1904 (in this case) one must know both.

It is difficult for a working entomologist, with his whole time to give to entomology, to keep touch of changes in nomenclature at all, and there can be but one result, to close to all but specialists in nomenclature all the literature of entomology prior to say, 1900, simply because of these changes in nomenclature. An entomologist now, relying on the *Fauna of India*, could not make himself understood by a worker using Hampson's catalogue of Lepidoptera Phalænæ, simply because they were using two systems of nomenclature, and when one considers that in America and on the Continent still more systems are in use, one realises how impossible it is.

Yet work must get done, and as the only solution, we must use the Fauna of India, corrected from Hampson as far as can be, and corrected entirely from the catalogue of Lepidoptera Phalænæ so far as it goes.

In Butterflies, Bingham's extremely practical and sane nomenclature in the Butterfly volumes will, we trust, be the standard for India for many years to come. In Micro-lepidoptera we have yet to get a system from Mr. Meyrick. If I may advise I would say that all Indian workers should agree to do this, not taking heed of other writers especially if they are not dealing with Indian forms. If one were to try to correlate Swinhoe for instance, with Hampson, chaos and confusion alone could result.

It is to be hoped that the commonsense of entomologists as a body will some day make itself felt and that the present incubus imposed by systematists may be removed.

The difficulties of identifying species are great and daily growing greater, but they are a trifle compared to the ever-increasing difficulty of choosing between and identifying synonyms in literature.

An account of the revised classification will appear shortly and any one wishing for a printed list of the families in order, can receive it on application to the Hon. Secy., Bombay Nat. Hist. Society.

Sept, 1908. H. M. L.

No. XXXI.—THE BOMBAY "SPINY LOBSTER."

As Captain Powell's valuable account of the Bombay spiny lobster in a recent number of your Journal (Vol. XVIII, No. 2, p. 360) suffers from the fact that the species he describes has not been identified, the following notes may be of interest to your readers although they contain no new information :—

The Rev. T. R. R. Stebbing says in his "History of the Crustacea" (London, 1893), "*Palinurus*, Fabricius, 1797, is restricted by Spence Bate to those species which have a small central rostriform tooth or tubercle that overhangs but does not cover or enclose the ocular segment, which have short flagella to the first antennal, and in which the segment that carries those antennal is anteriorly produced and laterally compressed in front. Such species appear to be confined to the northern hemisphere" (p. 195). "*Panulirus*, White, 1847, contains the numerous Eastern and one or two Western species, in which there is no central rostriform tooth, which have the ocular segment exposed and membranous, the flagella of the first antennal long and slender, and their segment produced considerably in advance of the frontal margin, that being generally armed with strong teeth" (p. 197). The most abundant species of *Panulirus* in Indian seas is *P. fasciatus*, Fabricius, which is probably that with which Captain Powell deals; but others occur, notably the deep-sea form *P. angulatus*, Spence Bate, which is not uncommon at depths of from 143 to 710 fathoms in the Arabian Sea. The Palinuridæ is one of the families of Decapod Crustacea which have not yet been properly investigated so far as the seas of India are concerned ; and probably there are species in our fauna as yet undescribed; but it is hoped that Colonel Alcock may deal with them in a future volume of his "Catalogue of the Indian Decapod Crustacea," in the first part of which (Brachyura, 1901) an account of the anatomy of a typical Indian form (namely *Nephrops andamanica*) will be found.

N. ANNANDALE, Superintendent,
Indian Museum (Natural History Section).

CALCUTTA, 13*th August* 1908.

No. XXXII.—SOME NOTES ON THE LOW-LEVEL LATERITE OF PORTUGUESE INDIA.

This rock is so well known as to require no detailed description.

In its normal form, it has been described as a porous argillaceous rock, much impregnated with iron peroxide irregularly distributed throughout the mass.

Its lateral distribution is fully treated in the Manual of Geology of India.

The origin of the rock appears to be still unknown and it remains a debatable point, whether laterite is detrital or merely the result of the decomposition "in situ" of the underlying rock.

The main argument in favor of the latter view is that the two rocks are seen to pass into each other.

All high level laterite, or those deposits of the rock found at a high elevation on the plateau of the Deccan and elsewhere, is supposed to have originated from the change of its underlying rock, generally a trap, while the low level type of the Konkan and East Coasts is generally granted to be of detrital origin.

While the writer was in Portuguese India, on a short geological tour, he had of necessity to traverse a considerable area of what is known as the low level laterite and his observations on its relation to the rocks immediately underlying, in many places, from Chapora southwards along the coast to Cabo de Rama and eastwards towards Sanvordem, may be of interest.

Near Chapora, along the sea coast, the laterite forming the main escarpment, was seen to lie unconformably on the tilted up and eroded edges of highly indurated shales and sandstones, associated with sills and dykes of basalt.

It extended inland, covering some fairly high hills in the neighbourhood of Assaugao.

There appeared to be no passage from the laterite downward into the underlying rocks.

East south-east from Marmagao, in the neighbourhood of Chandor, some hills, composed mainly of quartzites, rise out of the laterite covered plain, which is here slightly higher than the coast escarpment.

No trace of the laterite was found on the hills, which are well above the level of the laterite deposit, nor was there any sign of passage from one rock into the other observed at their point of contact.

Between Assolnam and Cabo de Rama on the Coast and in several places in the interior, where the laterite is found overlying the traps, the passage of the lower rock upward into the laterite is well seen. No sharply defined line at point of junction between the laterite and trap was noticed, the former rock having the appearance of having been formed by the change of the underlying trap.

The occurrence of several pieces of fossil wood, impregnated with the iron peroxide, in blocks of laterite cut in the neighbourhood, point, however, to the detrital origin of the rock in spite of the appearance of its having been formed "in situ."

The result of other observations seemed to confirm the fact, that when seen in association with shale, sandstone and quartzites, the laterite shows a discordance at the point of junction of the two rocks, while in those areas where it has been observed overlying trap and even hornblende-schists, there is an apparent passage from one rock into the other.

H. J. DAVIES.

YENANGYAUNG, U. B., 10*th June* 1908.

No. XXXIII.—THE INDIAN DOUM (*HYPHAENE*) PALM.

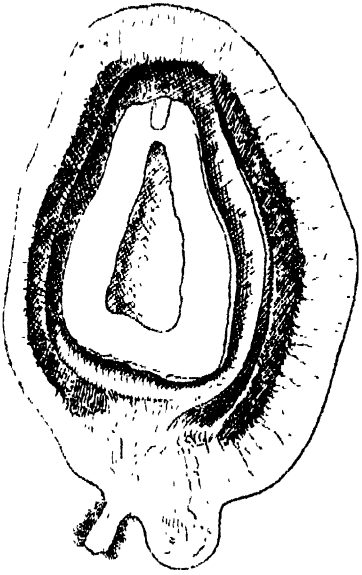
In a paper entitled "Le palme 'Dum' ed Hyphaene o più specialmente quelle dell' Affrica italiana" (*L'Agricoltura Coloniale*, ii, Florence, 1908, pp. 137—183) Prof. Beccari has reviewed the genus *Hyphaene* in chief part, and described the Indian plant as a new species under the name of *Hyphaene indica*. His specimens were obtained by Professor G. A. Gammie from the classic locality of Diu in Kathiawar, where the palm has long been known to grow: but it formerly always passed in books as identical with the Egyptian *H. thebaica*.

"*H. thebaica*," says Prof. Beccari, is a name much abused, which must henceforward be used only for the true dum palm of Egypt. He next proceeds to summerate and describe eleven other Hyphaenes of Egypt and the country between the Nile and the Red Sea. These are as follows: *H. coriacea*, Gaertn., and *H. crinita*, Gaertn., are ill-known species, probably Egyptian, but of unsatisfactorily recorded origin. *H. dunkaliensis*, Becc., is the dum palm of the African shore of the Red Sea, extending southwards to Obock. *H. nodularia*, Becc., is the tree of Barca, the fruit of which is largely sold in Eritrea for button making. Beccari gives an excellent photogravure of it. *H. benadirensis*, Becc., comes from a place called Billic at some small distance from the Juba river in Eritrea. *H. mangoides*, Becc., apparently belongs to the Somali Coast opposite Aden. *H. pyrifera*, Becc., *H. oblonga*, Becc., and *H. sphaerulifera*, Becc., come from the same region as *H. benadirensis*. *H. pleuropoda*, Becc., occurs on the Somali Coast at Makasi. *H. parvula*, Becc., comes from the boundary where Italian Somaliland and British East Africa touch. These are the twelve species from Egypt and the Red Sea-Coasts—the discussion of which makes the bulk of the paper: as a supplement to it we find inscribed the thirteenth, *H. indica*.

All the species differ from each other, notably in the shape of the fruit.

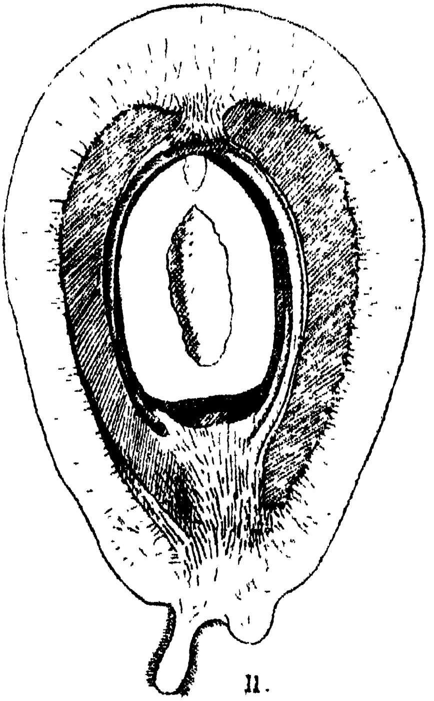
Professor Beccari is in possession of imperfect material of the Hyphaena which grows at Jaffna in the north of Ceylon. It differs notably he says from that of Diu, but because he had no fruits he is forced to leave it at present undetermined.

Professor Beccari, in a letter to the writer, asks if specimens of Hyphaene cannot be found along the Persian and Arabian Coasts, and if so, if some kind friend would obtain for him leaves, flowers and particularly fruits. If some reader could do this the results would certainly be of interest.



I

Hyphaene thebaica *Mart.*



II.

Hyphaene indica *Becc.*

Hyphaene palms are economic. The leaves of younger plants are eaten by camels. The old leaves are put to many minor uses. The trunk is used for making water conduits, and it is possible that it might contain a little sago in just the same measure as the common Indian fan palm, enough to make it a famine food. At Danakil toddy is drawn from the young flower spikes of one species. The outer part of the fruit is generally sweetish and edible so that Baillon picked up the name of "palmier pain d'epice" for *H. thebaica.* The outer part of the fruit of *H. dankaliensis* smells like molasses, but the chief use of the palm is for the manufacture of buttons from the hard inner fruit-wall.

I. HENRY BURKILL.

CALCUTTA, *September* 1908.

No. XXXIV.—SCIENTIFIC NOMENCLATURE, A PLEA FOR UNIFORMITY.

I notice in the April issue of the Society's Journal (Vol. XVIII, No. 2, page 505) that Major Wall in the course of some of his fascinating notes has occasion to refer to "*Lygosoma indica*" (sic).

Now it would be an impertinence on my part to venture to criticize any of Major Wall's notes, nor should I so venture, did I not suspect that he, decoyed by the siren sound of the final—"a" and preoccupied by other details of greater importance, had overlooked for the moment the derivation of the generic name.

The name, I fancy, is compounded of two Greek words "lygodes" (or some cognate word) meaning "flexible" and "soma" "a body," the latter term being neuter. In accordance with this Mr. Boulenger writes "*Lygosoma indicum*" in his "*Fauna of B. I., Reptilia.*"

The undesirability of attempting to reconstruct scientific mongrel forms which have become established by usage is admitted : but I hope that Major Wall will pardon my bringing to his notice this minor point, which I advance as an appeal for uniformity among the members of one Society, particularly when that uniformity is possible and scientific.

F. E. W. VENNING.

HAKA, CHIN HILLS, *1st August* 1908.

No. XXXV.—SHOOTING NOTES FROM THE GARHWAL HIMALAYAS.

Being unable to obtain leave earlier in the season of 1908, I left Bhim Tal *via* Almorah for the Garhwal Highlands somewhat late, *viz.*, May 26th, for a shot at a Tahr. I was however, owing to the late rains, able to get up to a height of 13,000 feet and attain my object and get back to Bhim Tal before the rains broke towards the end of June.

Some heavy showers and one stormy night of wind and rain were experienced on the top of the Gwaldom Tea Estate, but this caused us very little inconvenience.

At Gwaldom, Mr. Nash, the owner of a group of tea estates, kindly allowed us to pitch our tents on a fine bit of turf just above the tea and on the edge of the jungle, a secluded spot and surrounded by pines, commanding a magnificent view of Trisul, 23,406 feet above sea level. The next day, while having tea in the verandah of this gentleman's hospitable bungalow, I caught sight of an ice-axe leaning against the coping, and was told it belonged to Doctor Longstaff. We were afterwards shown many photographs taken by that intrepid climber of the snow ranges of Europe and the Himalayas. It may be remembered that he reached the top of Trisul with three companions, two being Swiss guides and the third the Subedar-Major of the 5th Gurkhas.

It was the last named who, when asked what he had seen from the top, replied : "Almora, Bombay, the Kala Pani and England" ; asked how he knew it was England, he replied "have I not been there?" As indeed he had, with Major Bruce in the Coronation year.

Lying in the verandah I also saw and measured a fine pair of Sambur horns that had just been brought in by a Garhwali villager who had found the dead body of the animal caught by the horns in the fork formed by two young "cheer" trees, *Pinus longifolia*: the right horn I found to be 34 inches and the left 35½, both having good brow and trez tines.

It was at this delightful camping ground on our return journey that I was awakened by the shikari in a very excited manner bearing the news that a couple of wild-dogs were attacking a boar near the spring which supplied our camp with water, situated about 800 yards above our tents. Thrusting my feet into a pair of boots I ran out as I was in pyjamas, but was too late to get a shot, though I heard the poor beast screaming as I ran up the hill, and so did my wife, who did not however leave the tent. The wild dogs had been frightened off their quarry by the coolies who ran up on hearing the noise of the scuffle. When I reached the spring the boar had managed to make off, floundering down the hill, while the two wild-dogs had gone along a spur of the hill. I followed them for some distance but could not get a sight of the brutes.

Mr. Nash told me that the jungles round there had been much harassed recently by these scourges and that the previous night a tigress had killed the stock bull down in a village near the Pindari river in a very bold manner, smashing open the door of the cow shed, shewing, I think, that she was very hungry but unable to find game for herself in the Gwaldom jungles, the wild dogs having driven it all away.

The tigress was a well known frequenter of the Gwaldom jungles, but never before had been known to take toll from the villagers, having confined herself to game killing only.

I found herds of goats and sheep right up to 11,000 feet guarded by very fierce half-bred Tibetan dogs, consequently the Tahr had gone further up to the highest ground below snow level. At 13,000 feet there was a fine grass growing that reminded me of the Sussex Downs and many wild flowers, the beautiful little blue iris being the most conspicuous. The Tahr ground was distinctly unpleasant and late in the afternoon, when the wind got up, one felt that one might easily be blown off the knife-edges at any moment. The Garhwal coolies all crouched when passing these places. On the side of the Dunga Bakial at 13,500 feet, I got a magnificent view of Trisul and the snowy ranges and could see the ripples on the snow crest of that trident like peak.

Major-General Macintyre in his delightful book, "Hindoo Koh," says this is so called by the natives from its irregular summit being supposed to resemble a Trisool or trident, which is by Hindoos regarded as symbolical of their divine triad, Brahma the creator, Vishnu the preserver, and Siva the destroyer.

I had to watch a couple of hours before I could get a shot at the Tahr, as the buck was on a ledge where I could not get down to him, though a couple of Tharni with their kids were playing about within 200 yards of me. I judged the age of the kids to be about a month, so that as this was on the 3rd of June it would make their birth about the beginning of May. The little things skipped about on a narrow shelf, over-hanging a precipice of a thousand feet, dislodging as they did so small stones that went hurling down into the canon reverberating like pistol shots. It took four Garhwal coolies a long time to recover the carcase of the Tahr, for the animal when shot went sliding down a moraine, and was only pulled up in the nick of time by a rock on the brink from going over a sheer drop of 2,000 feet.

While I cut off the head of the Tahr, the Garhwalies took out the liver and entrails and proceeded there and then to cook them, one man producing a pan from his voluminous blanket, while another ran for snow, a third going down to an old shepherd's hut, which we had passed on the way up, for sticks. I found the Tahr covered with ticks, but in good condition, though the flesh smelt so highly of old goat that I did not fancy the delicacy myself.

The callous patch on the breast was strongly marked and I should fancy that on the Dunga Bukail the Tahr seldom find space enough to lie down in the ordinary manner or able to stretch their legs out in a recumbent position.

While waiting for the coolies to bring up the dead Tahr I should have dozed off had I dared, the fact being that there was no level ground and no resting place broader than a foot, and the thought of rolling off into eternity should one move whilst sleeping, kept my eyes open.

The Garhwalies are fearless cragsmen, but terribly in awe of the Black Bear (*Ursus tibetanus*). On one occasion the shikari took me to a bluff above a clearing in which we had spied a bear feeding and wanted me to shoot, although it was quite 700 yards distant. Our real course should have been down the ridge which would have brought me right on to the top of the bear, but I think the shikari was a bit nervous and was quite contented to remain at a long range. We could not descend the bluff and had to retrace our steps, and so lost the chance of a shot at the beast. His stories too of their fierceness were many, and this dread of them I found general all through Garhwal and Kumaon.

While on my way down from Garhwal on the return journey, I met a coolie striding along with a load on his back and wearing a remarkable plate on his face; guessing from his action however that he was not suffering from leprosy, I stopped him and asked him the meaning of it. He informed me that some years ago a bear rushed out on him while he was cutting grass and had torn his face open and destroyed the nose, at the same time biting and breaking his arm. The headman of the village had bound up his arm which had healed up and except that it was a bit crooked, was otherwise normal, the village blacksmith making the plate he was wearing on his face. This plate was of copper with a triangular piece of metal (seemingly tin) riveted on with four copper rivets to the plate, forming a nose. The plate was kept in its place by a couple of brass wires that went round the back of the ears similar to spectacles. The teeth in his upper jaw appeared just below the copper plate giving the poor fellow a somewhat forbidding appearance.

Ursus tibetanus no doubt does much damage to the villagers when he thus comes across them, but I do not think he is the vicious brute they make him out to be, but in his blundering way is more anxious to get away than fight, and it is more in self-defence that he attacks them than from *malice prepense.*

While on a short visit to the romantic little lake Malwar Tal near Bhim Tal, during which time the rains broke, we had a constant cannonade of falling rocks and this seems to be such a familiar aspect of affairs to the Gooral that they would not budge from their resting places during the heat of the day by stones thrown down from above, and it required a rifle shot to disturb them.

On a ridge about 1,000 feet above the Lake, I watched for some time a fine male Pine Martin (*Mustela flavigula*) feeding on the half ripe figs of the "Peepul" (*Ficus religiosa*). He made off as soon as he saw me and I spared his life, as I was on the edge of the Gooral ground, and it was early morning when these animals are generally moving about.

R. H. HEATH, A.M.I.C.E.

FATEGARH, U. P., *July* 1908.

PROCEEDINGS

OF THE MEETING HELD ON 2ND JULY 1908.

A meeting of the members of the Bombay Natural History Society took place at the Society's Rooms on 2nd July 1908, the Revd. F. Dreckmann, S. J., presiding.

NEW MEMBERS.

The election of the following 25 new members since the last meeting was duly announced :—

Dr. George William Hardie (Big Conjeeveram, S. India), Major A. W. Hewetson R.F.A. (Jhansi), Mr. R. D. Murray (Kasauli); Mr. F. C. Beynon (Kasauli), Mr. E. C. Kent (Kalasa, P. O. Kadur, Mysore), Mr. C. W. E. Montgomerie (Mandla, C. P.), Mr. Alexander J. Gibson, I. F. S. (Dehra Dun U. P.); Mr. C. E. C. Cox, I. F. S. (Hoshangabad C. P.), Capt. F. E. Thornton (Bareilly), Lieut.-Col. H. R. D. Thring (Jubbulpore, C. P.); H. H. the Maharaja Lokendra Govind Singh Bahadur of Datia (Datia); H. H. the Maharaja Mahendra Yadvendra Singh Bahadur of Panna (Panna); Kumar Harpal Sing Bahadur of Alipura (Alipura); Mr. W E. Jardine, I.C.S. (Nowgong), Mr. W. Powell (Bombay). Mr. A E. Osmaston, I.F.S. (Naini Tal); Mr. R. C Milward, I.F.S. (Naini Tal) Mr W. L. Henderson (Nyaunghly, U. Burma); Mr. W. H. Pitt (Koraput) Mr. W. D Wright, I.M.S. (Baksa Duar, E Bengal); Mr. H. C. Wickham (Maymyo, Burma); Mr. H H. Massy (Maymyo Burma). Mr. E. L. Sim (Bombay) Mr M. H. Sowerby (Bombay) and Mr. J. P. Ross (Bombay).

CONTRIBUTIONS TO THE MUSEUM.

The Honorary Secretary, Mr. W. S. Millard, acknowledged the receipt of the following contributions since the last meeting :—

Contribution.	Locality	Contributor.
1 Tiger's skin and skull (*Felis tigris*) ...	Hoshangabad, C.P.	Major Stables, R. A. M. C.
1 Cat's skull (*Felis torquatus*)	Quetta... ..	E Comber.
1 Skin of Grey Flying Squirrel (*Pteromys oral*).	Hoshangabad, C.P..	C. E. C. Cox.
32 Bird skins	Shwebo, Burma ..	Major H., Delmé-Radcliffe.
Eastern Chinese Francolin (*Francolinus chinensis*).	......	Do.
Bengal Red-whiskered Bulbul (*Otocompsa emeria*).	... ..	Do
Common house Sparrow (*Passer domesticus*)	......	Do.
White-browed Fantail Flycatcher (*Rhipidura albifrontata*).	......	Do.
Orange-bellied Chloropsis (*Chloropsis hardwickii*).	......	Do
Pegu House Sparrow (*Passer flaveolus*) ...	......	Do.
Tree Sparrow (*Passer montanus*)	......	Do.
Common Iora (*Aegithina tiphia*)	......	Do
Finch-billed Bulbul (*Spizixus canifrons*) ...	...	Do.
Jerdon's Myna (*Graculipica burmanica*) ...	......	Do.

Contribution.	Locality.	Contributor.
Black-crested Yellow Bulbul (*Otocompsa flaviventris*).	......	Major H. Delmé-Radcliffe.
Burmese Red-vented Bulbul (*Molpastes burmanicus*).	......	Do
White-throated Babbler (*Argya gularis*) ...	......	Do.
Blue tailed Bee-eater (*Merops philippinus*).	......	Do
Blanford's Bulbul (*Pycnonotus blanfordi*).	......	Do
Thick-billed Green Pigeon (*Treron nepalensis*).	......	Do
Black-necked Myna (*Graculipica nigricollis*)	......	Do.
Spotted Owlet (*Athene brama*)	......	Do.
Black-gorgeted Laughing Thrush (*Garrulax pectoralis*).	......	Do
Red-headed Trogon (*Harpactes erythrocephalus*).	......	Do
Large-barred Jungle Owlet (*Glaucidium cuculoides*).	......	Do.
Burmese Shrike (*Lanius collurioides*) ...	......	Do
Chestnut-headed Bee-eater (*Melittophagus swinhoii*)	......	Do
Eastern Purple Heron (*Ardea manillensis*)	......	Do.
Barn Owl (*Strix flammea*)	......	Do.
Common Magpie (*Pica rustica*)	......	Do.
2 Eggs nest and skin of Yellow-throated Bulbul (*Pycnonotus xantholaemus*)	Horsely Konda ..	P. Roscoe Allen
2 Skins of Himalayan Brown Wood Owl (*Syrnium newarense*).	Kashmir ...	C H. Donald.
2 Eggs of Monal Pheasant (*Lophophorus refulgens*).	......	F. C. Mitchell.
1 Bulbul (*Cerasophila thompsoni*) ...	Burma... ...	A. K Macdonald.
2 Indian Hobbies (*Falco servus*)	......	......
1 Snake (*Typhlops brahminus*)	Bombay ...	A. M. DeCruz.
1 Snake (*Psammophis longifrons*)... ...	Godhra ...	F. Gleadow.
2 Lizard juv (*Varanus bengalensis*) ...	Kaira	A. Wood, I. C. S.
1 Snake (*Zamenis diadema*)	Quetta... ...	Lt. Thomas.
1 Snake (*Zamenis ventrimaculatus*) ...	Deesa	Lt. F. Miller.
3 Snakes (*Callophis macclellandi*, *Dinodon septentrionalis*, *Dipsadomorphus cynotus*).	Assam... ..	Major F. Wall, I. M. S.
2 Snakes (*Lycodon aulicus*, *Typhlops acutus*)	......	......
1 Spider and several Scorpions	Dharwar ...	C. Hudson, I. C. S.
12 Snakes	Muhammerah, Persian Gulf.	Lt. A. T. Wilson.
1 Snake (*Zamenis ventrimaculatus*) ...	Hyderabad Sind ...	R. A. Mess.
2 Spiders (*Galeodes sp.*)	......	F. Gleadow, I. F. S.
A collection of Fossils	Manchahar Beds, Karachi.	E. Comber.
1 Tortoise (alive)	Quetta ...	Baluchistan Nat. Hist. Soc.

Minor Contributions from Mr. Phillmore, R. E., and Capt. C. R. Kelly.

EXHIBITS.

The Reverend E. Blatter, S. J., exhibited a number of plants which he had prepared for the Society's Herbarium and which Capt. R. S. Gillespie, R. E., had collected in the Chamba State. Mr. John Wallace exhibited a thin section of the trunk of the interesting water-storing climber—*Calycopteris floribunda*.

PAPERS READ.

The following papers and notes were read :—

1. The Flora of Cutch, by Revd. E. Blatter, S. J.
2. Further notes on the butterflies of the Konkan, by G. W. V. de Rhé Philipe.
3. Crows and their sleeping places, by Revd. T. Bomford.
4. Flying Snakes, by Major A. Begbie.
5. Some notes on the low level Laterite in Portuguese India, by H. J Davies.

The meeting terminated with a vote of thanks to the various authors of the papers.

PROCEEDINGS

OF THE MEETING HELD ON 24TH SEPTEMBER 1908.

A meeting of the members of the Bombay Natural History Society took place at the Society's Rooms on Thursday, the 24th September 1908, the Hon'ble Mr. Justice Macleod presiding.

The election of the following 41 new members since the last meeting was duly announced :—

Mr. Gordon Hundley (Rangoon); Mr. M. C. Coote (Dilkhusha, U. P.); The Mess President, 117th Maharattas (Kamptee, C. P.); Mr. F. E. W. Venning (Haka, Chin Hills, Burma); Mr. E. O'Nash (Rangoon); Mr. H. S. Lane (Dharwar); Mr. J. P. Mullan (Bombay); Mr. W. Tudor Owen, I.C.S. (Palitana); Capt. C. D. Duxbury (Mhow, C. I.); Mr. R. Rees (Chandkhira, P. O. Sylhet); Mr. W. M. Logan Home (Nasirabad); Mr. David Mercer (Bombay); H. H. Maharaja Swai Sawant Sing Bahadur (Bijawar); Mr. E. Little (Poona); Mr. F. G. Gillies (Secunderabad, Deccan); Mr. H. G. Chippindall, R. E. (Lahore), Mr. D. R. S. Bourke, I.F.S. (Satara); Mr. A. P. Wilson (Muhamareh, Persian Gulf); Mr. Dharamdas Tribhuvandas Varjivandas (Bombay); The Mess Secretary, 2'th Cavalry, F. F. (Lahore); Mr. R. H Stallard, R. E. (Barrackpore); Mr. R. M. Adams (Murree, Punjab); Mr. E. H Nicholson (Trimulgherry, Deccan); Mr. A. J. Currie (Lahore); Mr. J. E. Needham (Bombay); Mr. E. J. Rowlandson (Vellore, N. Arcot); Mr. S. G. Pears, I. C. S. (Tochi, Miranshah, N. Waziristan); Mr. W. M. F. Pendlebury (Secunderabad, Deccan); Capt. E. Bissel, I. M. S. (Sehore, C. P.); Mr. C. D. Gregson (Bangalore); Capt. H. D. Peile, I. M. S. (Fatelgarh, U. P.). Mr. R. O. Logan (Dilkhusha, U. P.); The Mess President, 122nd Infantry, (Ahmedabad); Capt. W. K. Evans (Trimulgherry, Deccan); Capt. L. E. L. Burne (Falam, Chin Hills, Burma); Mr. Victor Kinloch (Klang, Federated Malay States); Mr. P. J. Rust, I. C. S. (Rupa, Umballa District); H. H. the Maharaja of Patiala (Patiala, Punjab); the Conservator of Forests, Mandla Division, C. P. (Jubulpore, C. P.); Capt. J. V. Ramsden (Poona); and Dr. B. K. Goldsmith (Bombay).

The Honorary Secretary, Mr. W. S. Millard, acknowledged the following contributions to the Museum since the last meeting :—

Contribution.	Locality.	Contributor.
1 Caracal (*Felis caracal*) Skin	Jalaun Dist., C. P.	L. R. Clarke, I.C.S.
1 Panther (*Felis pardus*) Skin	Aden Hinterland	A. S. Meek.
*2 Panther (*Felis pardus*) Cubs (alive)	Bhusaval	R. D. Bell, I. C. S.
*1 Sloth bear (*Melursus ursinus*) (alive)	Do.	Do.
1 Indian Palm Civet (*Paradoxurus niger*).	Castle Rock	W. F. Threlfall.
A number of mammal skins including :—		
1 Civet (*Viverra tangalunga*)	British North Borneo	From the Trustees of the British Museum.
1 Mungoose (*Mungos brachyurus*)	Do.	
White Gymnura (*Gymnura alba*)	Do.	
Large Bornean Squirrel (*Sciurus ephippium*).	Do.	
Sciurus vittatus, *Sciurus brookei*	Do.	
Sciurus prevosti	Do.	
1 Rat (*Mus neglectus*)	Do.	
1 Mouse Deer (*Tragulus hosei*)	Do.	
A small collection of bird skins and eggs including skins of the :—		
Indian Grey Shrike (*Lanius lahtora*)	Simla	Lt. H. M. Whittel.
Indian Redstart (*Ruticilla rufiventris*)	Do	Lt. Logan Home.
Coppersmith (*Xantholæma hæmatocephala*)	Do.	Do.
Himalayan Whistling Thrush (*Myiophoneus temmincki*)	Do.	Do.
Himalayan Streaked Thrush (*Trochalopterum lineatum*).	Do	Do.
Brown Hill Warbler (*Suya crinigera*)	Do.	Do.
Indian Bush Chat (*Pratincola maura*)	Do.	Do.
White-Cheeked Bulbul (*Molpastes leucogenys*).	Do.	Do.
2 Sandmartins (*Cotile riparia*)	Gyantse, Tibet	Lt. F. M. Bailey.
1 Indian Redstart (*Ruticilla rufiventris*)	Do.	Do.
1 Red-necked Mountain-Finch (*Montifringilla ruficollis*).	Do.	Do.
1 Himalayan Rough-legged Buzzard (*Archibuteo hemiptilopus*.	Do.	Do.
1 Pheasant-tailed Jacana (*Hydrophasianus chirurgus*)	Thikumgarh, Bundelkhand.	Raja Bahadhur Saheb of Orchha.
2 Golden Eagles (*Aquila chrysætus*)	Kashmir	C. H. Donald.
1 Imperial Eagle (*Aquila heliaca*)	Punjab	
4 Indian Tawny Eagles (*Aquila vindhiana*).	Do.	
1 Bonellis Eagle (*Hierætus fasciatus*)	Do.	
1 Long legged Buzzard (*Buteo ferox*)	Do.	
1 Crested Honey Buzzard (*Pernis cristatus*)	Do.	
1 Short-toed Eagle (*Circaëtus gallicus*)	Do.	
1 Shikra (*Astur badius*)	Do.	
1 Pale Harrier (*Circus macrurus*)	Do.	
1 Montagues Harrier (*Circus cineraceus*)	Do.	
1 Peregrine Falcon (*Falco peregrinus*)	Do.	
1 Black-winged Kite (*Elanus cæruleus*)	Do.	
2 Silver Pheasants (*Gennæus andersoni*)	Taungwin, Burma	C. H. Hopwood.
1 Grey-bellied Horned Pheasant (*Tragopan blythi*).	Chin Hills, U Burma.	Major H. A. F. Magrath.
1 Hodgsons Pipit (*Anthus rosaceus*)	Murree	Do.
1 Hume's Willow Warbler (*Phylloscopus humei*).	Do.	Do.

* These animals were forwarded to the Victoria Gardens, Bombay.

Contribution.	Locality.	Contributor.
1 Nest of Pale Bush-Warbler (*Horornis pallidus*).	Murree	Major H. A. F. Magrath.
1 Kashmir Wren (*Anorthura neglecta*)	Kashmir	Col. A. E. Ward.
1 Sooty Flycatcher (*Hemichelidon sibirica*).	Do.	
1 Little Forktail (*Microcichla scouleri*)	Do.	
1 Slaty-blue Flycatcher (*Cyornis leucomelanurus*)	Do	
1 Himalayan Streaked Laughing Thrush (*Trochalopterum lineatum*).	Do.	
1 Short billed Minivet (*Pericrocotus brevirostris*).	Do	
3 Clutches of Bronze-winged Jacana (*Metopidius indicus*) eggs.	Thana	H. Bulkley.
Nest and Eggs of Small white-throated Babbler (*Dumetia albigularis*).	Bellary	P. Roscoe Allen.
A number of Snakes and Lizards	Persian Gulf	Lt. A. T. Wilson.
A number of Lizards of 3 species— *Varanus bengalensis*, *Liolepis belliana* and *Calotes mystaceus*.	Shwebo, U. Burma.	Major H. Delmé-Radcliffe.
Snakes of the following species :—		
Trachischium tenuiceps	Darjeeling	Maj. F. Wall, I. M. S.
Trachischium guentheri	Do.	
Trachischium fuscum	Do.	
Tropidonotus subminiatus	Do.	
Tropidonotus himalayanus	Do.	
Lachesis gramineus	Do.	
Lachesis gramineus	Assam	
Dipsadomorphus cynodon	Jalpaiguri Dist.	
Bungarus lividus	Darjeeling	
Simotes albocinctus	Do.	
Ablabes rappii	Do.	
Oligodon melanus	Do.	
Hypsirhina sieboldii	N. W. Behar	
Amblycephalus monticola	Darjeeling	
Coluber prasinus	Do.	
3 Cæcilians (*Ichthyophis glutinosus*)	Do.	
3 Salamanders (*Tylototriton verrucosus*)	Do.	
2 Lizards	Do.	
1 young Cobra (*Naia tripudians*) (alive)	Bombay	H. B. Saxby.
1 Common green Whip-Snake (*Dryophis mycterizans*) (alive).	Do.	Maj Kilkelly, I. M. S.
1 Green Keelback (*Macropisthodon plumbicolor*).	Dharwar	H. M. Dwane.
1 *Typhlops brahminus*	Bombay	A. DeCruz.
1 *Zamenis ventrimaculatus*	Deesa	Capt. W. Glen Liston, I. M. S.
1 *Eryx conicus*	Colaba	Rev. H. Mould.
1 Green Keelback (*Marcropisthodon plumbicolor*).	Poona	Lt.-Col. H. S. McGill, R.A.M.C.
2 Tortoises	Bushire, Persian Gulf.	Major P. Z. Cox.
A number of land shells	Matheran	G. P. Millett.
A collection of 82 named species of Earthworms.	India	Trustees of Indian Museum.
5 species of fresh water Sponges	India and Burma	Do.
Some Hymenoptera and Diptera	Shwebo, U. Burma.	Major H. Delmé-Radcliffe.
Do. do.	Nasik	E. Comber.

MINOR CONTRIBUTIONS from :—**Major O. A. Smith, Lt.-Col. Childe, I. M. S., C. W. Thevenard, W. S. Rogers, L. H. Savile, Lt. F. M. Bailey, J. E. Needham,** the **Hon'ble A. Hill-Trevor, Lt. Willock** and **W. P. Pechey.**

EXHIBITS.

GORAL HEADS.

The Secretary drew the attention of members present to the pair of Goral heads, presented by General Osborn some time ago. These heads have been recently mounted in England for the Society, and make a valuable addition to the Museum.

A LIVE KING COBRA OR HAMADRYAD (*NAIA BUNGARUS*).

The Society has just obtained through Major Wall, I. M. S., another specimen of this interesting snake, alive. The one now exhibited measures about 9 feet in length and was caught in Assam.

PHOTOGRAPHS OF MOSQUITOS AND TSETSE FLY.

A set of photographs of the enlarged models of the malarial mosquito and tsetse fly from the cases in the entrance hall of the Natural History Museum, South Kensington, were exhibited. The Secretary mentioned that he found it was impossible to have similar cases brought out to India, even if the Society could afford it, owing to the models being made of wax which would probably melt in this climate. Mr. Kinnear had however arranged for these photographs to be taken and Mr. John Wallace was now having them mounted for the Society in an album.

INDIAN DUCKS AND THEIR ALLIES.

The book on this subject which has been recently published by the Society by subscription, was shown to members and greatly admired. It contains 30 illustrations of the finest chromo-lithography of the Swans, Geese and Wild Ducks which occur in India and will undoubtedly become a standard work on this subject.

Mr. Savile proposed a vote of thanks be passed to the Secretary for his work in connection with the production of this beautiful book which reflected so much credit on the Society, and Major Hoskyn having seconded it, this was carried.

PAPERS READ.

Captain Mackie, I.M.S., then read a paper by Captain W. Glen Liston, I.M.S., on the following subject :—

" The present epidemic of malaria in the port of Bombay, a description of the mosquito which is spreading the disease with some suggested remedies."

Captain Mackie observed that it was the irony of fate that Captain Liston was unable to be present at the meeting to read his paper owing to his having just been attacked by the very disease about which he was intending to speak. The paper appears in full on page 872 of this Journal.

* * * * *

Several members having spoken on the subject of the paper, Mr. Justice Macleod said that it was to be hoped that either the Municipality or Government would investigate the matter and he proposed a hearty vote of thanks to Captain Liston for his valuable paper and to Captain Mackie for reading it. This was passed unanimously and the meeting then terminated.

BALUCHISTAN NATURAL HISTORY SOCIETY.

PROCEEDINGS OF A MEETING OF THE MEMBERS HELD IN THE QUETTA MUSEUM AND LIBRARY BUILDING ON THURSDAY, THE 30TH APRIL, 1908.

1. Read letter, dated the 7th April 1908, from the Bombay Natural History Society, returning, duly identified by the British Museum, skins of—

(1) *Meriones erythrourus*, The Afghan Gerbille ;
(2) *Lagomys rufescens*, The Afghan Mouse Hare ;
(3) *Nesokia huttoni*, The Short-tailed Mole Rat ;
(4) *Mus bactrianus*, The Persian House Mouse .
(5) *Cricetulus phæus*, The Little Hamster ;
(6) *Ellobius fuscicapillus*, The Quetta Vole ;

sent to them on the 31st October 1907, with the remark that they had retained duplicates of (1), (2), and (3), and would be glad to be supplied with skins of *Cricetulus phæus*, the Little Gray Hamseer, and *Ellobius fuscicapillus*, the Quetta Vole, of which only one of each had been sent to them.

The Honorary Secretary reported having, in reply, sent the Bombay Natural History Society a skin of *Cricetulus phæus*, with a promise to send them the next skin obtained of *Ellobius fuscicapillus*.

2. At the Hon'ble President's request, Mr. Cumming placed before the meeting a list of the birds of Baluchistan, prepared by him from notes contributed from time to time to the Bombay Natural History Society's Journal by Captain T. E. Marshall, R. A., Major R. M. Betham, I. A., and Captain J. W. Watson, I. M. S., and from birds in the Quetta Museum, which had been identified by Rev. F. Lawrence and himself.

3. Amongst the contributions were a White-headed or Stiff-tailed Duck.

Colonel O'Donnell stated that the Duck had been shot by him at Khushdil Khan last February, and Sir Henry remarked that, though rather mutilated, the skin was well worth preserving, as the Stiff-tailed Duck was an extremely rare visitant to these parts.

4. Mr. Anderson enquired if anyone had seen in Quetta the Indian House or Sewer Rat (*Mus rattus*). The reply was in the negative. It was also remarked that the Common House Mouse of Quetta was *Mus bactrianus*, and not the Indian variety *Mus urbanus*, no skin of which had so far been sent to the Quetta Museum.

PROCEEDINGS OF THE MEETING HELD ON THURSDAY, THE 28TH MAY, 1908.

1. Read letter, No. 602, dated 27th April 1908, from Dr. N. Annandale, stating that, according to Oldfield Thomas, the rats identified by the British Museum as *Nesocia huttoni* were the same as *Nesocia hardwickei*, that name given by the Indian Museum to specimens sent to Quetta.

2. The following specimens were then passed round for the inspection of the members present:—

(1) A Pied Chat (*Saxicola picata*, Blyth), with two eggs, collected by Mr. J. W. N. Cumming.
(2) A female Indian Paradise Fly-catcher (*Terpsiphone paradisi*, Linn.) collected by Mr. J. W. N. Cumming.
(3) An Indian Oriole (*Oriolus kundoo*, Sykes) with nest, collected by Mr. B. H. Ford.
(4) A Hutton's Owlet (*Athene bactriana*, Blyth), collected by Mr. J. W. N. Cumming.
(5) A Quetta Vole (*Ellobius fuscocapillus*, Blanford), collected by Mr. Stevenson.
(6) Two Euphratic Vipers (*Vipera lebetina*, Daud), presented by Mr. Shiawakshaw Pherozeshaw.
(7) A Rat-snake (*Zamenis mucosus*), presented by Mr. W. R. S. Porter.
(8) A young Snake, presented by Mr. T. Clear.
(9) Four Sea Snakes, presented by Major R. A. E. Benn, C.I.E.
(10) A Viper (*Echis carinata*, Merr. Tent), from Karachi, presented by Mr. W. C. Clements.
(11) A small Tortoise (*Testudo horsfieldii*, Gray), from Hannah (near Quetta), a specimen of Chromite from Tor Jung, Hindubagh, and several Fossils from Surghand, 18 miles from Hindubagh, all presented by Mr. W. C. Clements.

3. With regard to the birds the Honorary Secretary remarked that though the Pied Chat was a familiar bird in Sind during the winter and in Quetta during the summer, he had never seen its eggs till the other day, when he found a nest with 3 fresh eggs under the roof of a hut on the Volunteer Rifle Range at Quetta; that records, however, existed to show that they had previously been collected in Quetta by Captain T. E. Marshall and Major R. Betham; that the Indian Paradise fly-catcher was an extremely rare bird in these parts, the specimen before the meeting being the first he had come

across in Baluchistan, while only one or two had been seen previously in Quetta by Captain T. E. Marshall and Mr. H. R. Smith ; that the Indian Oriole and its nests had been obtained at Galbraith Spinney in Quetta ; and that the Hutton's Owlet, though probably not noticed by many, was a fairly common bird in the station.

As regards the Quetta Vole he pointed out that its head and body measured 5", making it a larger specimen than the one previously obtained by Mr. A. Anderson and another described in the *Fauna of British India*, and asked whether, in view of the fact, it should be forwarded to the Bombay Natural History Society, to whom he had promised the next specimen secured. It was agreed that the specimen should be presented to the Bombay Natural History Society, members doing their utmost to try and secure further specimens for the Quetta Museum.

4. As regards the snakes, the Hon'ble Sir Henry McMahon remarked that the Euphratic Viper was of a very sluggish nature, and would not move out of the way for anyone ; that so far it had been recorded from Persia and Ziarat in Baluchistan, but the two specimens before the meeting having been found on the Sor Range, near Quetta, showed that they were also to be found in between these tracts of country, and would, doubtless, soon be recorded elsewhere in the mountainous tracts of Baluchistan ; it would appear in this country to take the place of the Russell's Viper (*Daboia russellii*), of which he had only seen two specimens in Baluchistan—one at Gwazha, South of Chaman, and one in the Kundar river valley in North Zhoc ; that the sea snakes had been obtained from Sonmiani, in Las Bela, where he had himself seen large numbers in the sea ; that though such sea snakes were always supposed by Scientists to be deadly poisonous, the people in Sonmiani and the Mekran Coast thought nothing of them, as was instanced by a man catching one for him with his hand. These people told him that the bite of these snakes produced no worse effects than a sore.

5. Read letter, dated 21st May 1908, from Dr. N. Annandale, in which he acknowledged the receipt of a land tortoise (*Testudo horsfieldii*, Gray), found at Sibi by Captain A. D. G. Ramsay, and forwarded to the Indian Museum, the Honorary Secretary remarking that from this very tortoise a number of ticks had been removed, and they had also since been forwarded to Dr. Annandale for identification.

6. Read list of donations made to the Museum since the last meeting. In this connection the Hon'ble President asked the members to try and secure further specimens of the Mottled Pole Cat and the Quetta Vole, and suggested that an attempt be made to keep alive the two young Mottled Pole Cats referred to in the list with a view to their being forwarded, later on when the weather became cooler, to the Bombay Natural History Society.

7. A list of the Birds of Ormara, prepared by Mr. W. D. Cumming of the Persian Gulf Telegraph Department, was finally placed before the meeting.

PROCEEDINGS OF THE MEETING HELD ON MONDAY, THE 27TH JULY, 1908.

1. Read letter, dated 4th June 1908, from Dr. Annandale, Superintendent of the Indian Museum, acknowledging receipt of certain specimens sent to him, including a second Land Tortoise (*Testudo horsfieldii*), and stating that, of the other specimens, the beetles collected by Sir Henry McMahon at Quetta on the 22nd March last were *Tropinota squalida*, Linn., that others were small *Scarabeidæ* (Dung Beetles) and *Ixodididæ* (Ticks) belonging to groups of which the Indian species have not yet been worked out : while the specimens of the little animals resembling the woodlouse, which swarms all over the roads in Quetta, were a variety (unnamed) of Isopod crustacea, which he was retaining for further study.

In passing round for inspection the specimens returned by Dr. Annandale, the Hon'ble President reminded the members that no specimens of *Testudo biluchii* had as yet been presented to the Quetta Museum, and urged its being looked for.

2. Special attention was invited by the Hon'ble President to the horns of the Indian Gazelle, which were of interest in that this Gazelle was found at Killa Saifulla, beyond which place the Gazelle usually found is the Persian Gazelle (*Gazella subgutturosa*, Guld).

Read letter, dated 17th June 1908, from the Honorary Secretary, Bombay Natural History Society, stating that he will be glad to receive the live Mottled Pole Cats, referred to at the last meeting, and send a couple of them on to the British Museum.

3. Read letter, dated the 14th July 1908, from the Honorary Secretary Bombay Natural History Society, returning the large Mouse Hare sent to him on the 22nd April, and stating that it had been identified by Mr. Wroughton, of the British Museum, as the Afghan Mouse Hare (*Lagomys rufescens*, Gray).

4. The Honorary Secretary next invited the attention of the members to a small collection of specimens (mostly birds) which the Museum had decided to forward as a donation to the Bombay Natural History Society in return for valuable assistance received from it.

PROCEEDINGS OF THE MEETING HELD ON SATURDAY, THE 29TH AUGUST 1908.

1. The Hon'ble President placed before the meeting a fresh "list of the Birds of Baluchistan," prepared by Mr. J. W. N. Cumming, in which he had embodied the list of the Birds of Ormara, received from Mr. W. D. Cumming (*vide* Proceedings of Meeting held on the 28th May last). He pointed out what a valuable contribution it was to the Society, and expressed the hope that members would do their best to collect all the additional information they could on the subject so as to make the list more complete.

Read letter, dated the 21st August 1908, from Captain A. D. G. Ramsay forwarding a donation of Rs. 30 to the funds of the Society. The Hon'ble President remarked that the time had not yet come to call on members of the Society for subscriptions or donations, but he urged on those who had not yet done so to become regular members of the Bombay Natural History Society, which charged an entrance fee of only Rs. 10 and an annual subscription of Rs. 15.

2. Read letter, dated the 21st August 1908, from Lieut. L. Lang, forwarding a specimen of the Tick which infested the barracks at Kalat, and had caused their abandonment, and another of a variety of Crustacea, found also in the same place. The Hon'ble President drew attention to the Tick, and pointed out that not only did this small insect cause much loss to Government by making buildings uninhabitable, but that its bite was well known to produce fever in human beings. Dr. Holland confirmed this and remarked that frontier sores had in some instances also been traced to the same cause.

3. The Hon'ble President then placed before the meeting a specimen of a snake (*Zamenis florulenta*), obtained in Quetta in August 1907, which he had sent to Colonel Wall for favour of identification. This snake was now referred to by Colonel Wall in the last issue of the Bombay Natural History Society's Journal. The Hon'ble President remarked that this variety of snake was to be found in Egypt but had never been before reported in India. The Horned Viper (*Eristicophis McMahonii*) found by him on the Baluch-Afghan Boundary. Commission, the Cerastes Viper recently found in the Gomal, and other reptiles belonging to Baluchistan proved the close relationship which existed between the Fauna of Egypt and Northern Africa and of this part of Asia.

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Clarke, Robt. L. H. (I.C.S.)	Orai, Jalaun Dist.
Clarkson, Lt.-Col. J. W. (I.M.S.)	*Europe.*
Clayton, Major E. F.	*Europe.*
Clifford, Capt. R.	Jhelum.
Clutterbuck, P. H. (I.F.S., F.Z.S.)	Nagpur, C. P.
Coates, Lt. E. C.	*Europe.*
Coates, V.	Barisal, Bengal.
Cobbe, Capt. C. C.	*Europe.*
Coen, W. W.	Hubli, S. M. Ry.
Coggan, R. T.	*Europe.*
Coghill, Capt. N. S. (I.A.)	Rajkote, Kathiawar.
Cogill, Dr. H. (M.R.C.S., L.R.C.P.)	*Europe.*
Cole, Lt. A. G. M.	Nasirabad.
Coleman, G. B.	Bombay.
Collings, F. W. (I.F.S.)	Pakokku, U. Burma.
Colomb, Lt.-Col. R. P.	Buldana, Berar.
Colombo Museum, The Librarian	Colombo.
Colston, Captain H. K.	Quetta.
Coltart, Dr. H. N. (Life Member	Samastipur, T.S.Ry.
Comber, Edward (F.Z.S.)	Karachi.
Combi, A.	Poona.
Conduitt, W. A. (C.E.)	Rangoon.
Coningham, M. E.	Secunderabad, Deccan.
Conley, Andrew	*Europe.*
Connor, Capt. F. P. (F.R.C.S., I.M.S.)	Calcutta.
Conservator of Forests, Berar Circle	Amraoti, Berar.
Conservator of Forests, N. C. Division	Jubbulpore, C. P.
Cooch Behar, H. H. Col. the Maharaja Sir Nripendra Narayen Bhup Bahadoor of (G.C.I.E.) (Life Member)	Cooch Behar.
Coode, J. M. (Life Member)	Rawal Pindi.
Cook, Geo.	Sinbo, Myitkyina, Burma.
Cooke, C. Allan	Bulsar.
Cooke, E. B.	Gwalior, C. I.
Cooke, J. V.	*Europe.*
Cooper, H. C. H.	Quetta.
Cooper, R. W.	Karachi.
Coote, M. C.	Dilkusha, Lucknow.
Copeland, T. B. (I.C.S.)	Abbottabad.
Coppinger, Capt. W. V. (I.M.S.)	Howrah.
Corbett, Capt. W. F.	*Europe.*

Cordue, Lt.-Col. W. G. R. (R.E.)	Bombay.
Cosens, Lt. G. P.	Lucknow.
Cossart, Capt. A. R. B. (R.F.A.)	Trimulghery, Deccan.
Cosserat, L. (C.E.)	Broach.
Cotton, C. W. E. (I.C.S.)	Calcutta.
Cotton, W. B. (I.C.S.)	Etah, U. P.
Courthope, E. A.	Dehra Dun, U. P.
Coventry, B. O. (I.F.S.)	*Europe.*
Coventry, F. C.	Wardha, C. P.
Covernton, Professor A. L.	Bombay.
Cowie, Rev. A. G. G.	Cawnpore.
Cox, C. E. C. (F.Z.S.)	Hoshungabad, C.P.
Cox, Major P. Z. (F.Z.S., F.R.G.S., C.I.E.)	Bushire.
Cox, S. (I.F.S.)	Russellkonda.
Craddock, W. H. (I.F.S.)	Rangoon.
Craig, C. W.	Bhatinda, Punjab.
Crawford, F. L.	Akola, Berar.
Crawford, Leslie	Bombay.
Crawford, W. L.	Saklaspur, Hassan.
Crawford, W. M. (I.C.S.)	Darjeeling, Bengal.
Crerar, J. (I.C.S.)	Hyderabad, Sind.
Cross, R. G.	Doloo, P.O., Cachar.
Crum, W. E.	Calcutta.
Cubitt, G. E. S. (I.F.S.)	Rangoon.
Cuffe, T. W.	Bombay.
Cumming, J. W. N.	Quetta.
Cumming, Lt.-Col. W. H. (R.G.A.)	*Europe.*
Curran, G. F.	Tarekere P. O., Kadur District.
Currie, A. J.	Lahore.
Currimbhoy Ebrahim, Sir	Bombay.
Currey, E. S.	*Europe.*
Currey, Lieut. V. F.	*Europe.*
Cursetji, Khan Bahadur C. M. (Life Member)	Bombay.
Cutch, H. H. Sir Shri Kengarji Sawai Bahadoor, the Rao Saheb of (G.C.I.E.) (Life Member)	Bhuj, Cutch.

Daintrey, W. M.	Manchester.
D'Albedyhll, C. C.	Hyderabad (Sind).
Dalgliesh, G.	*Europe.*
Dallaporta, J. N.	*Europe.*
Dalrymple-Hay, Mrs. L.	Trichinopoly.
Daly The Hon'ble Lt.-Col. Hugh (C.S.I.)	Indore, C. I.
Daly College, The Librarian	Indore, C. I.
Daniell, Col. A. C. (R.A.)	*Europe.*
Danson, J. W. W.	*Europe.*

Darjeeling, The Vice-President, Natural History Museum	... Darjeeling.
Datia, H. H. the Mharaja Lokendra Govind Singh, Bahadur	... Datia, C. I.
Davidson, J. (I.C.S.)	... *Europe.*
Davidson, Norman	... Jhelum.
Davies, H. J.	... Yenangyaung, U. Burma.
Davis, Lt.-Col. R. E. S. (I.M.S.) ...	... Rangoon.
Davys, Capt. G. Irvine (I.M.S.) ...	... Amritsar.
Dawson, W. H. (I.C.S.) (Life Member) ...	... *Europe.*
Deakin, Mrs. M. E.	... Bombay.
Deane, Dr. A. H.	... Bombay.
Deane, H. H. (C.E.)	... Bombay.
De Carteret, St. G.	... Banda, U. P.
D'Souza, C.	... Toungoo, Burma.
De Cruz, A. M.	... Bombay.
DeSouza, A. B.	... Jalgaon, Khandesh.
Delmé-Radcliffe, Lieut. A.	... Satara.
Delmé-Radcliffe, Major H.	... *Europe.*
Delmé-Radcliffe, Capt. S.	... Japan.
Dempster, F. E. (C.I.E.)	... *Europe.*
Dempster, Lieut. G. H.	... Delhi.
Dening, Capt. H.	... Maymyo, Burma.
Des Vœux, Major H.	... Mandalay, Burma.
Dewar, D. (I.C.S.)	... *Europe.*
Dewes, Major F. J. (I.M.S.)	... Tunggyi, S. Shan States.
Dhar, H. H. the Raja of	... Dhar, C. I.
Dharamdas Tribhuvandas Varjivandas.	... Bombay.
Dharampur, Kumar Shree Vijayadevji of	... Dharampur.
Dhunjibhoy Bomanji (Life Member) ...	... Bombay.
Dimmock, Lt.-Col. H. P. (M.D., I.M.S.) ...	... Bombay.
Dixey, Revd. Mr. Duncan (C.M.S.) ...	... *Europe.*
Dixit, D. L. (B.A.)	... Poona.
Dixon, R. M. (B.A.)...	... Poona.
Dodd, Lt.-Col. J. R. (R.A.M.C.) ...	... Dehra Dun, U. P.
Dodgson, J. (I.F.S.)...	... Dhulia.
Dodsworth, P. T L. (F.Z.S.)	... Simla.
Donaghey, J. O'B.	... Bangalore.
Donald, C. H.	... Simla.
Donald. J. (I.F.S.)	... Chanda, C. P.
Donovan, Major C. (I.M.S.)	... Madras.
Douglas, S. M. (B.A.)	... Rangoon.
Douglas, Commander W. R. B. (R.I.M.)	... Rangoon.
Douie, The Hon'ble Mr. J. M. (C.S.I., I.C.S.)	... Rawal Pindi.
Downing, A. K. Weld	... Coonnoor P. O., Nilgiris.

Dracott, C. H.	... Quetta.
Drake-Brockman, Major D. H. ...	... Lansdowne, Garhwal, U. P.
Drake-Brockman, Maj. H. E. (I.M.S., F.Z.S.) (Life Member)	... Bombay.
Drake-Brockman, Maj. V. G. (I.M.S.) ...	... Bombay.
Dreckmann, Rev. F. (S.J.)	... Bombay.
Drummond, J. R. (B.A., F.L.S.) ...	... *Europe.*
Drury, E. N.	... Thayetmyo, Burma.
DuBoulay, J. H. (I.C.S., C.I.E.)... ...	... *Europe.*
Duke, Lt.-Col. J. (I.M.S.)	... Kapurthala.
Dumayne, F. G.	... Calcutta.
Dunbar-Brander, A. (I.F.S.)	... Hoshangabad.
Dunn, C. W. (I.C.S.)	... Rangoon.
Dunn, Major H. N. (R.A.M.C.) ...	... Umballa.
Dunsterville, Col. K. S. (R.A.)... ...	... Poona.
Dunsterville, Major L. C.	... Dera Ismail Khan.
Durie, G. A.	... Pegu, Burma.
Duxbury, Capt. C. D.	... Mhow, C. I.
Dwane, E. H.	... Secunderabad, Deccan.
Dwane, F. C.	... Yellandu, Deccan.
Dwane, Major J. W.	... *Europe.*
Dwane, H. M.	... Madras.
Dyson, Lieut.-Col. T. E. (I.M.S.) ...	... Poona.

Ede, F. J. (A.M.I.C.E.)	... Silchar, Cachar.
Edwards, W. N.	... Majulighur, Assam.
Egerton, B. (C.I.E.)...	... Hyderabad, Deccan.
Elgee, Major J. W. L.	.. Benares.
Elliott-Lockart, Major P. C.	... *Europe.*
Elliot, Capt. C.	... Kohat.
Elliott, A (C.I.E.)	... *Europe.*
Ellis, E. V. (I.F.S.)	... Toungoo, L. Burma.
Ellis, R. H. (I.C.S.)	... Malappuram, Malabar District.
Elwes, H. J. (F.R.S.)	... *Europe.*
Emanuel, A. E. L. (I.C.S.)	... *Europe.*
English, A. E. (I.C.S.)	... Bassein, Burma.
Enthoven, R. E. (I.C.S.)	... Bombay.
Evans, Evan	... Planters Stores, Dibrugarh, Assam.
Evans, Percy C.	... Bindgei, Lankat, Sumatra.
Evans, Vety.-Lt.-Col. G. H. (F.L.S.) ...	... Rangoon.
Evans, Capt. W. H. (R.E.)	... *Europe.*
Evans, Capt. W. K.	... Trimulgherry.

Fagan, H. R.	Rangoon.
Falkiner, Dr. J. M.	Dibrugarh, Assam.
Farrel, R. C. (I.F.S.)	Secunderabad (Deccan).
Farrington, Sir H. A., Bart. (I.F.S.)	Khulna, Bengal.
Fatehsingrao of Akalkote, H. H. Raja	Kirkee.
Faulkner, P. L.	Shillong, Assam.
Faunthorpe, J. C. (I.C.S.)	Kheri.
Fayrer, Capt. F. D. S. (I.M.S.)	Gwalior, C. I.
Fearon, H. M.	Madras.
Fenton, Col. L. L.	Bombay.
Fenton, Lieut. L. S.	Kolhapur.
Ferguson, H. S. (F.Z.S., F.L.S.)	*Europe.*
Ferris, Col. W. B.	*Europe.*
Few, H. W.	Monywa, Upper Burma.
Field, Frank	*Europe.*
Field, J. A. (R. E.)	*Europe.*
Filson, J. T. W.	Bainton, San Thome, Madras.
Finlay, C. K.	Rangoon.
Fischer, C. E. C. (I.F.S.)	Bombay.
Fisher, W. F. D. (I.F.S.)	Belgaum.
Fitz-Gerald, Capt. O. A. G.	Commander-in-Chief's camp, India.
Fitz-Gibbon, P. J.	Bombay.
Fletcher, Lieut. T. Bainbrigge (R.N., F.E.S.)	Ceylon.
Florence, James	*Europe.*
Forbes, Capt. A. H. M.	Bareilly.
Forbes, C. H. B.	Bombay.
Forbes, Col. James	Bombay.
Forbes, J. D.	*Europe*
Forbes-Sempill, The Hon'ble R. A.	Bangkok, Siam.
Forel, Monsieur Auguste (Hon. Correspg. Member).	*Europe.*
Forster, T. W. (B.F.S.)	Tharrawaddy, Burma.
Forsyth, H. W. S. (R.E.)	Agra.
Forsyth, Dr. W.	Calcutta.
Foster, Capt. R. B. B. (I.M.S.)	*Europe.*
Foster, R. Guy	Sallabile P. O., Kadur District.
Foulkes, George F. F. (I.F.S.)	*Europe.*
Foulkes, Capt. H. D.	*Europe.*
Foulkes, R.	Coimbatore.
Foulkes, Major T. H. (I.M.S.) (Life Member)	Madras.
Fraser, Prof. J. N.	Bombay.
Fraser, The Hon'ble Mr. S. M. (I.C.S., C.I.E.)	Bangalore.

Fraser, W. S.	Ajmere, Rajputana.
Frederick, Capt. E. B.	Trimulgherry, Deccan.
Frenchman, Lt.-Col. E. P. (I.M.S.)	Rangoon, Burma.
Friedlander and Son, Messrs. R.	*Europe.*
Frost, G.	Quetta.
Fry, John F.	Bombay.
Fuller, Dr. Chas. A.	Cawnpore.
Fulton, Capt. H. T. (D.S.O.) (Life Member)	Cawnpur.
Fulton, Col. R.	*Europe.*
Gale, Capt. E. S.	Kohima, Assam.
Galloway, R.	Secunderabad.
Gamble, J. S. (I.F.S., F.L.S.)	*Europe.*
Gammie, Prof. G. A.	Poona.
Garrett, H. B. G. (S.F.S.)	Bangkok, Siam.
Garrett, J. H. (I.C.S.)	Bombay.
Gaye, W. C.	Secunderabad.
George, C. P.	Secunderabad.
Gerhardt, Paul	Karli.
Ghosal, J. (I.C.S.)	Surat.
Gibson, A. J. (I. F. S.)	Dehra Dun, U. P.
Gibson, R. E. (I.C.S.)	Hyderabad, Sind.
Gilbert, C. E. L. (I.F.S.)	Bandra, Salsette.
Gilbert, Reg. (F.Z.S.)	*Europe.*
Gilbert-Cooper, W. J. (I.F.S.)	Kado, Moulmein.
Giles, A. R.	Patna.
Gill, Capt. C. A. (I.M.S.)	Lahore, Punjab.
Gill, C. G.	Amritsar.
Gill, H.	Bombay.
Gillespie, Capt. R. S. (R.E.)	Bombay.
Gillett, Capt. E. S. (A.V.D.)	Ahmednagar.
Gillies, F. G.	Secunderabad (Deccan).
Gillum, S. J.	Bombay.
Gimlette, Lt.-Col. G. H. D. (C.I.E., I.M.S.)	*Europe.*
Gimlette, Dr. J. D.	Singapore.
Gladstone, H. S. (F.Z.S.)	*Europe.*
Glaeser, John	Calcutta.
Glascock, L. C.	Phillour Fort, Punjab.
Glazebrook, N. S.	Bombay.
Gleadow, F. (F.R.M.S.)	*Europe.*
Gloster, Capt. J. H. (I.M.S.)	Bombay.
Godber, Rev. John	Calcutta.
Godden, A. L.	Tezpur, Assam.
Godwin-Austin, H.	*Europe.*
Goldsmith, Dr. B. K.	Bombay.
Gonsalves, Dr. J. F.	Bandra.

Gordon, D. M.	Keng Tung, S. Shan States.
Gordon, Capt. E. B.	Peshawar.
Gordon, R. G. (I.C.S.)	Jetalsar.
Gordon-Ralph, J. B.	Saidpur, E.B.S.Ry.
Gore, F. W.	Hoogrijhan P. O., Assam.
Gore, Col. St. G. C. (R.E., C.S.I.)	*Europe.*
Gossage, F. H.	Maskeliya, Ceylon.
Gough, Major C.	Ahmednagar.
Gover, A. A.	Madras.
Graham, Capt. B. C.	Dharamsala, Punjab.
Graham, D. N.	Bombay.
Graham, G. E. R. (I.C.S.)	Mundla, C. P.
Graham, J. A.	Mercara, Coorg.
Graham, L. (I.C.S.)	Dharwar.
Graham, R. J. D. (M.A.)	Nagpur, C. P.
Grant, C. F. (I.C.S.)	Rangoon.
Grant, F. A.	Port Blair, Andamans.
Grant, John F.	Mahokoti, Nazira, Assam.
Gray, Chas.	Coonoor.
Gray, P. B.	Bombay.
Greaves, H. R.	Bombay.
Greaves, S. E.	Bombay.
Green, E. Ernest (F.E.S.)	*Europe.*
Green, James	*Europe*
Green, Lt.-Col. J. S. (R.A.M.C.)	Nasirabad, Rajputana.
Greer, W. (I.C.S.)	Ratnagiri.
Gregson, C D.	Bangalore.
Gregerson, Dr. J. D.	P. O. Jakai, Assam.
Gregorson, T. S.	Bombay.
Greig, Joseph	Bagh-o-Bahar, Cachar.
Greig, Capt. W. B.	Sakesar-Mianwali District, Punjab.
Gribbon, M. C.	Kohat.
Griffith, Capt. R. H. (R.F.A.)	Hyderabad, Deccan.
Grönvold, H.	*Europe.*
Grubbe, Major E. A.	*Europe.*
Guyon, Capt. G. S.	Trimulgherry, Deccan.
Habibuddin, S. (N.C.S.) (Life Member)	Hyderabad, Deccan.
Haeberle, Curt. (I.F.S.)	*Europe.*

Haffenden, Ed. D. H.	Mandalay, Burma.
Haigh, P. B. (I.C.S.)	Bombay.
Hale, Major C. H. (R.A.M.C.)	Secunderabad.
Hall, W. D.	Bombay.
Hamburg Natural History Museum, The Director.	Hamburg.
Hamilton, A. G.	*Europe.*
Hamilton, J. D. (B.F.S.)	*Europe.*
Hammond, A. H.	Bombay.
Hampson, Sir George F. (Bart.), (F.L.S., F.E.S.)	*Europe.*
Hankin, A. C. (C.I.E.)	Hyderabad, Deccan.
Hannyngton, W. O.	Shwebo, Burma.
Harcourt, Capt. J. S. M.	Dehra Dun, U. P.
Hardie, Dr. Geo. W.	Big Conjeeveram, S India.
Hardy, A. W.	Talup, Assam.
Hardy, G. S. (I.C.S.)	Belgaum.
Harington, Major H. H.	Bhamo, Burma.
Harington, Col. V. (I.M.S.)	*Europe.*
Harker, O. Allen	Satara.
Harper, E. W. (F.Z.S.)	Bedford, England.
Harris, Capt. O. M. (R.H.A.)	Kumasi, Ashanti, W. Africa.
Harrison, A. J.	Lakhimpur, Assam.
Harrison, Major C. B. (I.M.S.)	*Europe.*
Hart, E. H.	Lonavla.
Harter, R. W.	Bombay.
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Harvey, W. L. (I.C.S., C.I.E.)	Calcutta.
Hasted, Major A. W.	Kasauli.
Hasted, H. R. G.	Mangalore, S. India.
Hasted, J. E. H.	Chittoor, N. Arcot.
Hasted, W. A.	Palamcottah, Tinnevelly District.
Hatchell, D. G.	Madras.
Hate, Vinayek N.	Bombay.
Haughton, Samuel (C.C.S.)	*Europe.*
Hauxwell, T. A. (I.F.S.)	Rangoon.
Hawkins, A. B.	Digboi P. O., U. Burma.
Hayden, H. H.	Calcutta.
Hearn, E. S.	Bombay.
Hearsey, T. N. (I.F.S.)	Nilambur, S. Malabar.
Heath, R. H. (C.E.)	Fatehgarh.
Heeckerenz, Baron Von (Hon. Corrpg. Member)	Java.
Henderson, Capt. R. R.	*Europe.*
Henderson, W. L.	Nyaunghla, U. Burma.

Hendley, Lt.-Col. Harold (M.D., I.M.S.)	Rawal Pindi.
Hepburn, W.	Mandalay.
Herbert, Lt.-Col. H. (I.M.S.)	*Europe.*
Heseltine, Capt. J. E. N.	Jubbulpore, C. P
Hetherington, A. L. (B.A., F.C.S.)	Rangoon.
Hewetson, Major A. W. (R.F.A.)	Jhansi.
Heygate, Lt.-Col. R. H. G. (D.S.O.)	*Europe.*
Hichens, G. W.	Rangoon.
Hickman, R. St. J.	Kalighat P. O., S. Sylhet.
Hide, P. (Life Member)	Indore, C. I.
Higgins, H. A.	Hatikhira P. O., Sylhet.
High Range Natural History Society, The President	Munnar P. O., S. India.
Hignell, S. R. (I.C.S.)	Daltonganj, E. I. Ry.
Hill, Claude H. (I.C.S., C.I.E.)	Rajkote, Kathiawar.
Hill, Lieut. R. D. O. (Life Member)	Chitral.
Hill-Trevor, Hon'ble A. E.	Bombay.
Hine-Haycock, A. L.	Colombo, Ceylon.
Hitchcock, H. J.	Malapuram, Malabar District.
Hoare, H. J. (I.C.S.)	Lucknow.
Hobart, C. H.	Kindat, Burma.
Hodgkinson, Capt. C.	Ferozepore.
Hodgson, Hon'ble Mr. H. P.	Ootacamund.
Hoghton, Major F. A.	Dhera Ismail Khan.
Hojel, Major J. G. (I.M.S.)	*Europe.*
Holberton, N. V. (I.F.S.)	Toungoo, L. Burma.
Holbrooke, Capt. B. F. R.	*Europe.*
Hole, R. S. (I.F.S.)	Bombay.
Holkar, H. H. the Maharaja Tukuji Rao (Life Member)	Indore, C. I.
Holme, H. B. (I.C.S.)	Rangoon.
Holmes, H. R.	*Europe.*
Hoosein Belgrami, The Hon'ble Mr. Syed Nawab Imud-ul-Mulk Bahadoor	*Europe.*
Hoosainee, Mahomed Abdoola	Hyderabad, Deccan.
Hope, A. J. R.	*Europe.*
Hopwood, J. C.	Akyab, L. Burma.
Hosken, A. Fayrer	Secunderabad, Deccan.
Hoskyn, Major C. R. (R.E.)	Bombay.
Hotson, J. E. B. (I.C.S.)	Bombay.
Howell, E. B.	*Europe.*
Howell, G. C. (I.C.S.)	Kulu, Punjab.

Howlett, Col. A. (I.S.O.)	*Europe.*
Howlett, T. M. C. (M.A., F.E.S.)	Pusa.
Hudson, Major C. T. (I.M.S.)	Nasik.
Hudson, C. W. M. (I.C.S.)	*Europe.*
Hudson, Lt. P.	Rangoon.
Huggins, J. R.	Chicawle, Ganjam Dist.
Hughes, Lieut. F. L.	Dehra Ismail Khan.
Hughes, T. O.	Mekran, Baluchistan.
Hulbert, Col. J. G. (I.M.S.)	*Europe.*
Hume, H. R. (D.S.P.)	Satara.
Humphrey, J.	Bombay.
Humphrys, Lieut. F. H.	Oghi, Hazara Dist.
Hundley, G.	Rangoon.
Hunt, C. B. Holman	London.
Hunt, A. R. (I.F.S.)	Betul, C. P.
Hunt, Dr. E. H.	Secunderabad.
Hunt, F. W.	Somaliland.
Hunter, Lieut.-Genl. Sir A.	*Europe.*
Husbands, H. W. S. (A.M. I.C.E.)	Jalna, Deccan.
Husbands, J. E. (I.C.S.)	Ahmednagar.
Hutchinson, Lt. C. G.	Minbu, Burma.
Hutchinson, F. G.	Uran, Kolaba Dist.
Hutchinson, Capt. F. H. G. (I.M.S.)	Belgaum.
Hutchinson, F. T.	*Europe.*
Hutchinson, Capt. L. T. R. (I.M.S.)	*Europe.*
Hyam, Judah (G.B.V.C., F.Z.S.) (Life Member)	Pusa, Bengal.
Hyde-Cates, Lt.-Col. G. E.	Palanpur.

Ichalkaranji, The Hon'ble Narayenrao Govind *alias* Babasaheb Ghorpade, Chief of (Life Member)	Kolhapur.
Ilbert, L. G.	Sibsagar, Assam.
Inglis, C. C.	Mirpurkhas, Sind.
Inglis, Chas. M. (Life Member)	Durbhanga.
Ingram, Capt. A. C. (I.M.S.)	Saugor, C. P.
Innes, Capt. H. (I.M.S.)	Barisal, E. Bengal.
Inverarity, J. D. (B.A., LL.B.) (Life Member)	Bombay.
Ireland, S. G. deC. (I.C.S.)	Bombay.
Irwin, C. J. (I.C.S.)	Jubbulpore, C. P.
Ivens, Lt. H. T. C.	Kohat.
Ivens, J. H. (P.W.D.) (Life Member)	Agra.
Iyer, V. Subramania (M.A.)	Dehra Dun, U. P.

Jackson, Mrs. F. E.	*Europe.*
Jackson, H. (I.F.S.)	Naini Tal, U. P.

Jackson, Major J. (I.M.S.)	Poona.
Jacob, W. R. LeGrand (I.F.S.)	Jalpaiguri, E. Bengal and Assam.
James, Major C. H. (I.M.S.)	*Europe.*
James, Lt. F. H.	Hyderabad, Sind.
Jamkhandi, Shrimant Parashram Ramchandra Patwardhan, The Chief of (Life Member)	Kolhapore.
Jamsetji M. Doctor	Bombay.
Janjira, H. H. Sir Sidi Ahmed Khan (K.C.I.E.) Nawab of (Life Member)	Janjira.
Jardine, A. J. A. (D.S.P.)	Maymyo, U. Burma.
Jardine, E. R.	Rangoon.
Jardine, M. R.	Bombay.
Jardine, W. E. (I. C. S.)	Nowgong.
Jayakar, Lt.-Col. A. S. G. (I.M.S.)	Bandra.
Jeddere-Fisher, H. C.	Trimulghery, Deccan.
Jellett, H. H.	*Europe.*
Jencken, Lt.-Col. F. J. (R.A.M.C.)	Meerut.
Jenkins, N. M. (R.G.A.)	Karachi.
Jenkins, S. E. F. (I.F.S.)	Loilem, S. Shan States, Burma.
Jennings, Major J. W. (R.A.M.C.)	Mandalay, Burma.
Jennings, Major W. E. (I.M.S.)	Bombay.
Jephson, E. J.	Mingin, Burma.
Jermyn, Lt.-Col. T.	Saugor, C. P.
Jesse, William	Meerut.
John, H. C. (C.E.)	*Europe.*
Johnston, E. G.	Mandalay, Burma.
Johnstone, J. W. D.	Calcutta.
Joll, Lieut. H. H. (R.F.A.)	Mian Mir, Punjab.
Jones, Lt.-Col. F. W. C. (R.A.M.C.)	Kamptee, C. P.
Jones, Lt.-Col. J. Lloyd (I.M.S.)	Calcutta.
Jones, Major M. D. Goring	Lucknow.
Jones, Capt. T. W. H.	Bangalore.
Jones, W. Harvey	Calcutta.
Jowitt, John F.	Bandarwella, Ceylon.
Jukes, J. C. E. (I.C.S.)	Bombay.
Kagal, Meherban Piraji Rao Bapu Saheb Ghote, Chief of	Kagal, S. M. C.
Karachi, The Curator, Victoria Museum	Karachi, Sind.
Keddie, D. L.	Hminelongyee, Papan, Burma.
Kelly, B. P.	*Europe.*
Kelly, Capt. C. R. (R.G.A.)	Satwari, N. W. R (Jummu.)

Kelsall, Capt. H. J. (R.A.)	Hongkong.
Kemball, H. L.	*Europe.*
Kemball, H. V. (C.E.)	*Europe.*
Kendall, Capt. C. J. (R.I.M.)	*Europe.*
Kennedy, R. M. (I.C.S.)	Ahmedabad.
Kennion, Major R. C. (F.Z.S.)	Seistan.
Kenny, S. D. (I.F.S.)	*Europe.*
Kent, E. C.	Kalasa, P.O. Kadur, Mysore.
Kenyon, J. H.	Peermade, Travancore.
Kerkhoven, E. J. (Hon. Correspg. Member)	Java.
Kerr, Dr. A. F. G.	Chiengmai, Siam.
Kerr, H. R.	Pyinmana, U. Burma.
Kerr, N.	Bombay.
Kettlewell, Capt. H. W.	Fyzabad, Oudh.
Keys, H. W. (I.F.S.)	*Europe.*
Keys, Capt. W. D. A. (I.M.S.)	*Europe.*
Khan, Muncherji Framji (Life Member)	Colombo, Ceylon.
Khareghat, M. P. (I.C.S.)	Ratnagiri.
Kiddle, J. A. C.	Mong Haw, Shan States.
Kilby, R. G. (I.C.S.)	*Europe.*
Kilkelly, Major P. P. (I.M.S.)	Bombay.
Kilner, Dr. J. N. (M.B.)	Chinpina, Adra, Bengal.
King, C. A.	Coonoor P. O., Nilgiris.
King, Capt. Geo. (I.M.S.)	Puri, B.-N. Ry.
King, R. C. H. Moss (I.C.S.)	Saugor, C.P.
Kingston, A. H.	Bombay.
Kinloch, A. M.	Kil-Kotagiri, Nilgiris.
Kinloch, Victor	Klang, Federated Malay States.
Kirk, R. T. F. (I.C.S.)	Jalgaon, East Khandesh.
Kirkpatrick, W. McColin	Delhi.
Kirtikar, Lt.-Col. K. R. (I.M.S., ret.)	Andheri, Salsette.
Knyvett, W. A.	Chinsura, Bengal.
Kolhapur, H.H. the Maharaja Sir Shahu Chhatrapati (G.C.S.I., G.C.V.O.) (Life Member)	Kolhapur.
Kotah, H.H. the Maharaja Sir Umed Sing, Bahadoor (K.C.S.I.) (Life Member)	Kotah.
Kushal Pal Singh, Raja	Kotla P. O., Agra District.
Kynaston, E.	Yantiyantola, Ceylon.

Lace, John H. (I.F.S., F.L.S.)	Maymyo, Burma.
Lahore Punjab Veterinary College, The Principal	Lahore.
Laird-MacGregor, E. G. L. (I.C.S.)	Karwar.
Lamb, Major Geo. (I.M.S.)	Kasauli, Punjab.
Lamb, The Hon'ble Mr. R. A. (I.C.S., C.I.E.) (Life Member)	Bombay.
Land Records and Agriculture, The Director of	Poona.
Lane, H. S	Dharwar.
Lane, Capt. W. H.	Fort Sandeman, Baluchistan.
Lawrie, A. S. (P.W.D.)	The Nagavalli Project, Vizagapatam Dist.
Lawrence, Revd. Mr. F. (C.M.S.)	Quetta.
Lawrence, T. R.	Bombay.
Le Mesurier, H. P. (C.E.)	Calcutta.
Lee, Major A. W. H.	Prome, L. Burma.
Lee, Major F.	Potchefstroom, Transvaal, S. Africa.
Lee-Wilson, Rev. H. W.	Poona.
Lees, D. H. (Life Member)	*Europe.*
Lees, John	Itakhola P. O., Sylhet.
Leeson, G. W.	Barisal, Bengal.
Leete, F. A. (F.C.H., I.F.S.)	Tharrawaddy, Burma.
Lefroy, H. Maxwell (M.A., F.E.S., F.Z.S.)	Pusa, Bengal.
Legge, The Hon'ble Gerald	Johore, Straits Settlements.
Lehmann, Dr. Adolf	Bangalore.
Lennox, Capt. G. M.	Falam, Chin Hills.
Leslie, A. K.	Bombay.
Leslie, Major G. A. J. (R.E.)	Kirkee.
Leslie, Major W. C. C.	Chakrata.
Lethbridge, Capt. W. (M.D., I.M.S.)	*Europe.*
Light, Capt. W. A.	Bombay.
Lightfoot, S. St. C.	Taunggyi, U. Burma.
Lincoln, Capt. C. H. (I.M.S.)	Dhulia, Khandesh.
Lindley, E. S. (C.E.)	Bombay.
Lindsay-Smith, Capt. J.	Lyallpur.
Linnell, Fred.	Rangoon.
Liston, Capt. W. G. (I.M.S.)	Bombay.
Little, E.	Poona.
Little, F. D.	Toungdwingyee, U. Burma.
Lloyd, Capt. C. R. (A.S.C.)	Bombay.

Lloyd, Capt. R. A. (I.M.S.)	Jhelum.
Loam, Mathew	*Europe.*
Loch, Maj. F. R. E. (I.S.C.)	Mhow, C. I.
Lodge, G. E.	*Europe.*
Logan, The Hon'ble Mr. A. C. (I.C.S.)	Bombay.
Logan, R. O.	Dilkusha, U. P.
Logan Home, Lt. G. R. S.	*Europe.*
Logan Home, W. M.	Neemuch.
Long, G. R. (I.F.S.) (Life Member)	*Europe.*
Long, Capt. H. W. (R.A.M.C.)	Jullundur.
Longden, C. C.	Colombo, Ceylon.
Lory, F. B. P. (M.A.)	Ahmedabad.
Lovegrove, W. H. (I.F.S.)	Jummoo.
Lovell, E. H. (R.A.)	Ferozepore.
Lowis, Major R. M.	Umballa.
Lowndes, G. R.	Bombay.
Lowrie, A. E. (I.F.S.)	Raipur, C. P.
Lowsley, C. O.	Jacobabad, Sind.
Luard, Capt. C. E.	*Europe.*
Luck, W. H.	Rajkote.
Lucknow, The Curator & Sec., Provincial Museum	Lucknow.
Lumsden, O. F. (I.C.S.)	Ferozepore, Punjab.
Lushington, P. M. (I.F.S.)	Manantody, N. Malabar.
Lyall, Capt. R. A.	Wano, Waziristan.
Lyell, Lt. A. G.	Lansdowne, Garhwal, U. P.
Lynn, G. R. (C.E.)	Manora, Karachi.
Macaulay, L. A.	Bombay.
MacDonald, Dr. D. (Life Member)	*Europe.*
MacDonald, J.	Bombay.
MacDonald, K. C. (D.S.P.)	Moulmein, Burma.
MacGregor, Capt. R. D. (I.M.S.)	Loi Mwe, S. Shan States.
Mackay, C. J.	Cawnpore.
Mackenna, J. (I.C.S.)	Mandalay, Burma.
Mackenzie, Colin A.	Ootacamund.
Mackenzie, Capt. J. F. (R.A.M.C.)	Meerut, U. P.
Mackenzie, Kenneth	Kurnool, Madras.
Mackenzie, Capt. K. L. W.	Benares.
Mackenzie, M. D.	Mirpur Khas, Sind.
Mackenzie, M. M.	Saran, Bengal.
Mackie, A. W. W. (I.C.S.)	Belgaum.
Mackinnon, P. W. (F.E.S.)	Mussoorie, U. P.
MacMillan, R. W. M.	Rajamundry, Godavari Dist.
MacNair, R. H. (I.C.S.)	Calcutta.

Mackwood, F. M.	Colombo.
Macleod, The Hon'ble Mr. Justice N. C.	Bombay.
Macnab, A. M.	Maymyo, Burma.
Macnaghten, H. P. W. (B.A.)	Bombay.
Macpherson, Col. T. R. M.	*Europe.*
Macrae, Major J. L. (I.M.S.)	Bellary.
Macwatt, Lieut.-Col. R. C. (I.M.S.)	Jodhpur, Rajputana.
Macworth, Capt. N. W. (I.M.S.)	Bombay.
Madras, The Professor of Zoology, Madras Christian College	Madras.
Madras, The Principal, Presidency College	Madras.
Madras, The Director of Agriculture	Madras.
Madras, The Librarian, Govt. Central Museum	Madras.
Magrath, Major H. A. F.	Bannu, N. W. F. P.
Mahaluxmiwalla, C. D.	Bombay.
Mahomedbhoy Currimbhoy Ebrahim	Bombay.
Main, T. F.	Poona.
Mair, A.	Calcutta.
Major, Major F. F.	Fort Sandeman, Baluchistan.
Malcolm, T.	Rajamundry.
Manavadar, Khan Shree Fatehdinkhan, Chief of (LifeMember)	Manavadar, Kathiawar.
Manders, Lt.-Col. N. (R.A.M.C., F.Z.S., F.E.S.) (Life Member)	Colombo, Ceylon.
Mandlik, Narayan V. **(Life Member)**	Bombay.
Mann, H. H.	Poona.
Mann, T. H.	*Europe.*
Manners-Smith, Major J. (V.C., C.I.E.)	Nepal.
Manson, C. E. F.	*Europe.*
Marjoribanks, G. (I.F.S.)	N. D. Canara.
Marjoribanks, N. E. (I.C.S.)	Madras.
Marker, Khan Saheb Ardesir D.	Quetta.
Marsden, E.	Bombay.
Marshall, Arch. McL. **(Life Member)**	*Europe.*
Marshall, A. W.	Bombay.
Marshall, D.	*Europe.*
Marshall, Dr. H. H. (L.R.C.S.)	Rangoon.
Marshall, J. G. F. (B.F.S.)	Tavoy, Burma.
Marshall, J. McL. **(Life Member)**	*Europe.*
Marshall, Major T. E. (R.A.)	*Europe.*
Martin, James	Dehra Dun, U. P.
Martin, Col. Gerald **(Life Member)**	*Europe.*
Martin, L. K. (I.F.S.)	Chanda, C. P.
Martyn, H. F.	Buldana, Berar.
Masani, A. M. **(Life Member)**	Baroda.
Mason, C. W.	Pusa, Bengal.

Masson, The Hon'ble Sir D. P. (K.C.I.E.)	Lahore.
Massy, H. H.	*Europe.*
Maxwell, F. D.	Maubin, Burma.
Maxwell, Capt. W. F. (R.E.)	*Europe.*
Mawson, Mrs. O. S.	*Europe.*
Mayne, Capt. H. B. (R.G.A.)	Bombay.
McCarrison, D. L. (D.S.P.)	Tellicherry, N. Malabar.
McConaghey, Major A., Political Agent	Quetta.
McCormack, R. B.	Cocanada, Godavari District.
McCrie, C. M. (I.F.S.)	Saugor, C. P.
McDonough, A. D.	Campbellpore and Attock.
McDougall, E. (D.S.P.)	Myitkyina, U. Burma.
McGlashan, John (C.E.)	Calcutta.
McIntosh, Alex. (C.E.)	*Europe.*
McIntosh, R. (I.F.S.)	Tharrawaddy, Burma.
McKerron, R. G. (M.A., I.C.S.)	Rangoon.
McKendrick, Capt. A. G. (I.M.S.)	Kasauli, Punjab.
McKenna, Capt. J. C.	Manipur, Assam.
McLaughlin, Capt. H. D.	Abbottabad.
McLeod, Major-Genl. D. J. S. (C.B., D.S.O.)	*Europe.*
McMahon, Col. The Hon. Sir A. H. (K.C.I.E., C.S.I.)	Quetta.
McMullen, Capt. G. C.	Kotri, Sind.
McNeale, J. H.	Seoni, C. P.
McNeill, J. (I.C.S.)	Ahmednagar.
McPherson, Capt. G. (I.M.S.)	Karwar.
McPherson, Capt. J. (I.M.S.)	Bombay.
Mead, P. J. (I.C.S.)	*Europe.*
Meade, Col. M. J. (C.I.E.)	Baroda.
Mears, Capt. A. (I.A.)	Bombay.
Meinertzhagen, Lieut. R.	*Europe.*
Menon, K. G.	Trichur, Cochin.
Mercer, David	Bombay.
Merewether, Major H. D.	Mahikantha.
Mess President, 1st Royal Sussex Regt.	Umballa.
Mess President, 1st Battn. 10th Gurkhas	Maymyo, Burma.
Mess President, 32nd Pioneers	Umballa.
Mess President, 2nd Worcestershire Regt.	Ahmednagar.
Mess President, 1st Battn. 39th Garhwal Rifles	Lansdowne, Garhwal, U. P.
Mess President, 117th Marathas	Kamptee, C. P.
Mess President, 122nd Infantry	Ahmedabad.
Mess President, 44th Merwara Infantry	Ajmer.
Mess President, 85th Regiment (K.S.L.I.)	Fyzabad.

Mess President, 110th Mahratha L. Infantry	Ahmednagar.
Mess President, 130th Baluchis	Chaman.
Mess President, 1st South Wales Borderers	Quetta.
Mess, 74th Punjabis, Hon. Secy., Book Club	Saugor, C. P.
Mess, R. E., Hon. Secretary	Roorkee.
Mess, R. F. A. (40th and 45th Battery) Hony. Secretary	Hyderabad, Sind.
Mess Secretary, 59th Scinde Rifles F. F.	Peshawar.
Mess Secretary, 87th Punjabis	Jhansi.
Mess Secretary, 25th Cavalry, F. F.	Lahore.
Messent, P. G. (C.E.)	Bombay.
Metcalfe, J. G. E.	Bombay.
Meyer, Dr. F. A.	Bombay.
Meyer, O.	Bombay.
Meyrick, E. (F.R S.)	*Europe.*
Millard, W. S. (F.Z.S.) (Life Member)	Bombay.
Miller, G. A.	*Europe.*
Millett, G. P. (I.F.S.)	Bandra.
Milne, Mrs. Leslie	Rangoon.
Milne, Major C. J. Robertson (I.M.S.)	*Europe.*
Mills, J. D. (Life Member)	*Europe.*
Milward, R C. (I. F. S.)	Naini Tal U. P.
Minns, Mrs. H. C.	*Europe.*
Miraj, Shrimant Gungadharrao Ganesh, *alias* Babasaheb Patwardhan, Chief of (Life Member)	Miraj.
Mitchell, H. H. G.	Madras.
Mitchell, J. C. H.	Derrang, Halem P. O., Assam.
Moberly, Mrs. B. M.	Hyderabad (Deccan).
Mockler, Major G. F.	*Europe.*
Modi, Bomanji Edulji	Kaira.
Moggridge, C. B.	*Europe.*
Mollison, J.	Nagpur, C.P.
Monté, Dr. D. A. de (L.M. & S.)	Bandora.
Monteath, G. (I.C.S.) (Life Member)	Bombay.
Monteath, J. (I.C.S.)	Rajkote, Kathiawar
Montgomerie, A. (I C. S.)	Satara.
Montgomerie, C. W. E. (I. C. S.)	Mandla, C. P.
Montresor, Capt. L. B. (R.F.A.)	*Europe.*
Moore, T. D.	Bombay.
Moore, T.	Waltair, Vizagapatam Dist.
Moore, W. (F.I.C.)	Bombay.
Morgan, Mrs. Chas.	Mangalore.
Morgan, V. G. (I.F.S.)	Mandla, C. P.
Morgan, W. de (C.E.)	*Europe.*
Morris, Major A. H. (R.A.M.C.)	*Europe.*

Morris, Major D. O.	*Europe.*
Morris, Capt. G. M.	Bombay.
Mosse, Capt. A. H. E. (Life Member)	*Europe.*
Moule, Capt. H. E.	Myitkyina, U. Burma.
Mowbray, G. B. De	Maskeliya, Ceylon.
Moylan, W.	Calcutta.
Muir, G. B. F. (I.C.S.)	Farrukhabad, U. P.
Mudhol, Shrimant Malojirao Rage Ghorpade, Chief of	Mudhol, S. M. C.
Mullan, J. P.	Bombay.
Müller, Professor O. V.	Bombay.
Mullins, Lt.-Col. W. B.	Jullundur.
Mumford, J.	Bombay.
Mundy, B. H. H. (F.R.G.S.)	Bombay.
Mundy, N. S.	Silchar, Cachar.
Munna Lâl, Dr. (L.M. & S.)	Jalaun, Orai Dist.
Murison, Capt. C. C. (I.M.S.)	Sukkur.
Murphy, Capt. A. (I.M.S.)	Bombay.
Murray, R. D.	Kasauli.
Murray, S. B. (P.W.D.)	Madras.
Muspratt, Lt.-Col. F. C.	Shau-hai-Kwan, N. China.
Mysore, The Superintendent, Mysore Government Museum	Bangalore.
Mysore, H. H. the Maharaja Krishna Raj Woodayar Bahadoor of (Life Member)	Mysore.
Nagpur, The Curator, Central Museum.	Nagpur.
Nangle, H. C.	Thaton, Burma.
Nangle, Capt. M. C.	Rangoon, Burma.
Napier, A. G. Fitz.	Bombay.
Napier, A. H. (I.M.S.)	Jhelum.
Naranji Dwarkadas (Life Member)	Bombay.
Narrotumdas Morarji Gooculdass (Life Member)	Bombay.
Nasrulla Khan, H. H. Nawab Mahomed	Bhopal, C. I.
Nawab Mahomed Salamulla Khan, Khan Bahadur.	Buldana, Berar.
Nene, Sadashive Sitaram	Sangamner, Ahmednagar Dist.
Neale, W. N.	Tankari, Broach District.
Needham, J. E.	Bombay.
Newill, T. N. C.	*Europe.*
Newbold, Major A. W.	Kohat, Punjab.
Newcome Lionel	Somwarpet P. O., N. Coorg, S. India.
Newnham, Lieut.-Col. A. (F.Z.S.)	Kasauli, Punjab.

Nicholson, E. F. (F.Z.S.)	Bombay.
Nicholson, E. H.	Trimulgherry, Deccan.
Nicholson, Capt. W. C	Ferozepore.
Nisbet, J. E. S.	Shwebo, Burma.
Nisbett, Major W. G.	Bhamo, Burma.
Nizam's College, The Librarian	Hyderabad, (Deccan.)
Noyce, F. (I.C.S.)	Madanapalle, Cuddapah Dist.
Nunn, H. (I.C.S.)	Mandla, C. P.
Nurse, Lt.-Col. C. G. (F.E.S.) (Life Member)	*Europe.*
Nuttall, W. M.	Dibrugarh, Assam.
Oakes, M. H. (D.S.P.)	*Europe.*
Oates, E. W. (F.Z.S.) (Hon. Correspg. Member)	*Europe.*
Oberholser, H. C.	Washington, U. S. A.
O'Brien, Capt. Edward	Sadra, Mahikantha
O'Donnell, Lt.-Col. T. J. (D.S.O., R.A.M.C.)	Quetta.
O'Nash, E.	Calcutta.
Ogilvie, A. W. (S.F.S.)	Paknamps, Siam.
Ogilvie, Major E. C. (R.E.)	Lahore.
Okeden, W. P.	Rangoon.
Oldham, Capt. L. W. S. (R.E.)	Nagpur.
Oliver, Lt.-Col. L. G.	Lebong, Bengal.
Olivier, Col. H. D. (R.E., F.Z.S.) (Life Member)	*Europe.*
Ollenbach, O. C.	Dehra Dun, U. P.
Opiumwalla, Dorab E.	Bombay.
Orchha H. H. the Raja Bhagvunt Singji	Tikumgarh, Bundelkhund.
Orr, Capt. H. M. C.	Kamptee, C. P.
Orr, J. P. (I.C.S.)	Ootacamund.
Osborn, Genl. W.	Naggar Kullu, Kangra District.
Osmaston, A. E. (I.F.S.)	Naini Tal, U. P.
Osmaston, B. B. (I.F.S.)	Naini Tal, U. P.
Osmaston, L. S. (I.F.S.)	Dhulia.
Ostermayer, G.	Bombay.
Owen, W. Tudor (I.C.S.)	Palitana, Kathiawar.
Oxley, Capt. J. C. S. (I.M.S.)	Seoni-Chappara, C. P.
Packard, Capt. H. N. (R.A.)	*Europe.*
Page, W. G.	*Europe.*
Page, W. T. (F.Z.S.)	*Europe.*
Page, W. W. K.	Calcutta.
Painter, H. L. (I.C.S.)	Dharwar.

Palanpur, Shah Zada Taley Mahomed Khan	Palanpur.
Palmer, W. L.	Dehra Dun, U. P.
Panna, H. H. the Maharaja Mohendra Yadvendra Singh Bahadur	Ajmere.
Panter, Lt. G. A. E.	Jersey, Channel Islands.
Parasu Ramdas Patro, A. (B.A.)	Berhampur.
Parker, R. N. (I.F.S.)	Kotgarh, Simla Dist.
Parnell, R. (I.F.S.)	Lahore, Punjab.
Parrington, Lt. J. W. (R.A.)	*Europe.*
Parsons, M. D.	Pyinmana, U. Burma.
Parshotumdas Vishram Maoji	Bombay.
Partridge, E. A.	Secunderabad, Deccan.
Pasco, J. Harding	Kulla Kambay, Nilgiris.
Pasteur Institute of India, The Director	Kasauli, Punjab.
Patel, Khan Bahadoor Burjorji D.	Quetta.
Patiala, H. H. the Maharaja of	Patiala, Punjab.
Patterson, Dr. R. L.	Bindukuri, Assam.
Patton, Capt. W. S. (I.M.S.)	Madras.
Pawalla, Jamsetji C.	Bombay.
Payn, Capt. W. A.	*Europe.*
Payne, R. (B.A.)	Bankipur, E. I. Ry.
Pearce, Major C. R. (I.M.S.)	Maymyo, Burma.
Pearless, S. H.	Ceylon.
Pears, S. G. (I.C.S.)	Miranshah, N. Waziristan.
Pearse, Lt.-Col. J. L.	Fyzabad.
Pearson, R. S. (I.F.S.)	Karwar.
Pechey, W. P.	Ajmere.
Peile, Capt. H. D. (I.M.S.)	Fatehgarh, U. P.
Pendlebury, W. M. F.	Secunderabad, Deccan.
Penno, Dr. F. L. (M.R.C.S., L.R.C.P.)	Bombay.
Percival, A. P. (I.F.S.)	Mandla, C. P.
Percival, G. S. P.	Mercara, Coorg.
Perreau, Capt. G. A.	Bakloh, Punjab.
Perrot, Lt. H. S. (R.G.A.)	*Europe.*
Pershouse, Lt. S.	*Europe.*
Pestonji Jivanji (N.C.S.) (Life Member)	Hyderabad, D.
Peters, Col. C. T. (I.M.S. Retd.)	Dinajpur.
Petit, Bomanji Dinshaw (Life Member)	Bombay.
Petit, Dhunjibhoy Bomanji (Life Member)	Bombay.
Petit, Jehangir Bomanji (Life Member)	Bombay.
Peto, Lieut. Clement H.	Rawalpindi.

Phillimore, Capt. R. H. (R.E.)	Maymyo, Burma.
Phipson, H. M. (F.Z.S.) (Life Member)	*Europe.*
Pickersgill-Cunliffe, Lt. J. C.	Bombay.
Pilcher, Major A. J. (R.E.)	Cawnpore.
Pilcher, Col. J. G. (I.M.S.)	*Europe.*
Pile, J.	Secunderabad, Deccan.
Pinhey, Lt.-Col. A. F. (C.I.E.)	Rajputana.
Pitt, W. H.	Koraput, Vizagapatam Dist.
Pollard, G. F. (F.Z.S.)	Bombay.
Polovtsoff, Mons. A.	*Europe.*
Polwhele, A. C. (C.E.)	Allahabad.
Poncins, Baron Edmond de (Life Member)	*Europe.*
Pope, J. A. (I.C.S.)	Satara.
Porter, W. R. S.	Quetta.
Pottinger, Lieut. J. A.	Jhelum.
Pottinger, Major R. S.	Baroda.
Powell, Dr. A.	Bombay.
Powell, J. E.	*Europe.*
Powell, W.	Bombay.
Praed, Lt. G. A. M.	Fort William.
Prall, Major S. E. (I.M.S.)	Aden.
Pratt, H. C.	Selangor, Federated Malay States.
Prescott, Lieut. C. W.	Kohat.
Preston, F. J.	Bombay.
Prichard, G. M.	Ramtek, C. P.
Prideaux, C. C. A.	*Europe.*
Prideaux, G. W. B.	Taunggyi, Burma.
Priestley, E.	*Europe.*
Primrose, Alex. M.	Hantapura P. O., Duars.
Procter, The Hon'ble Mr. H. E.	Bombay.
Proctor, Capt. Alfred H. (I.M.S.)	Amritsar.
Punjab Agricultural College, The Principal	Lyallpur, Punjab.
Punjab Government Horticultural Gardens, Supdt.	Lahore.
Purkis, F. C. (B.F.S.)	Rangoon.
Purkis, H. V.	Tissa P. O., Chumba State.
Quinlan, D.	Calcutta.
Raby-Noble, W.	Behali P.O., Assam.
Raikes, E. B.	Bombay.
Raikes, G. T.	Quetta.
Rajkumar College, the Principal	Rajkote.

Ralston, Lt. W. H.	Tientsin, N. China.
Ramsay, N.	Rangoon.
Ramsden, Capt. J. V.	Poona.
Rattray, Col. R. H.	*Europe.*
Ravenshaw, Col. C. W. (Life Member)	*Europe.*
Readymoney, N. J.	Bombay.
Rebello, Revd. João	Marmagoa, Goa.
Rees, H. C.	Pegu, Burma.
Rees, R.	Chandkhira P. O., Sylhet.
Rees, W. E.	Gaya, Bengal.
Reeve, R.	Bombay.
Reid, Cecil H. (I.C.S.)	Calcutta.
Reid, M. F. (C.I.E.)	*Europe.*
Reid, W. J. (I.C.S.)	*Europe.*
Reilly, N. E.	Panjgur, Mekran Coast.
Rendall, H. D. (I.C.S.)	Rajkote.
Rennick, Capt. Alex. de C.	Nagpur.
Rennie, Thos. (I.C.V.D.)	Rangoon, Burma.
Reynolds, D. (R.F.A.)	Nowshera.
Reynolds, L. W. (I.C.S.)	Datia, C. I.
Rhé-Philipe, G. W. V. de	Calcutta.
Rhenius, C. E.	Vellore, N. Arcot. District.
Rhodes, T M.	*Europe.*
Richards, B. D.	Bombay.
Richardson, Cecil	Ajmer.
Richardson, Lt. G. G.	Karachi.
Richardson, H. L.	Bombay.
Richmond, R. D. (I.F.S.)	*Europe.*
Ritchie, Capt. C. McI. (R.H.A.)	*Europe.*
Ritchie, F.	*Europe.*
Roberts, Capt. A. S. B.	Rangoon.
Roberts, Major M. B. (Life Member)	Lansdowne, U. P.
Robertson, B. (I.C.S., C.I.E.)	Calcutta.
Robertson, T. B.	Jacobabad.
Robertson, J. H. (I.C.S.)	Ootacamund.
Robertson, L. (I.C.S.)	Bombay.
Robertson, L. V. M. (I.C.S.)	Broach.
Robinson, H. K. (I.F.S.)	Kurseong.
Rodger, A. (I.F.S.)	Mogok, U. Burma.
Rodon, Major G. S. (F.Z.S.)	Dharwar.
Rogers, C. G. (I.F.S.)	*Europe.*
Rogers, Capt. F. C. (I.M.S.)	Nellore.
Rogers, J. B. Leslie	Bombay.
Rogers, Rev. K. St. A.	Rabai, East Africa
Rogers, W. S.	Bombay.

Rome, Lt. H. C.	Dehra Ismail Khan
Ronald, A. G.	Chotapalli, Vizagapatam Dist.
Rooke, E. A.	Sugdalpur, Bastar State, C. I.
Rose, Col. H.	Satara.
Ross, J. P.	Bombay.
Ross, Major Tyrell (Life Member)	*Europe.*
Row, Dr. R. (M.D.)	Bombay.
Rowland, Dr. S.	*Europe.*
Rowlandson, E. J.	Velloro, N. Arcot Dist.
Ruddle, W. H.	Secunderabad.
Russell, J. B.	Saklaspur Hassan, Mysore District.
Russell, Hon'ble Mr. Justice L. P.	Bombay.
Rust, P. J. (I.C.S.)	Rupar, Umballa Dist.
Rutherford, W. F.	Bombay.
Ryan, G. M. (I.F.S.)	*Europe.*
Rylands, H. R.	Simla.
Ryves, A. E.	Allahabad.
Sale, Edward L. (I.C.S.)	Ahmednagar.
Salkeld, Capt. R. E.	Kismayu, British East Africa.
Salmon, Lt. W. H. B.	Rawalpindi.
Salt, H. F. (R.H.A.)	Meerut.
Saone, G. Prier De	*Europe.*
Sassoon, Mrs. S. D.	*Europe.*
Saunders, Major F. W. (R.E.)	Lucknow.
Savile, L. H.	Bombay.
Schelling, A.	Bombay.
Scindia, H. H. the Maharaja Madho Rao (G.C.S.I., G.C.V.O.) (Life Member)	Gwalior, C. I.
Scot, J. S. (I.F.S.)	S. Coimbatore, Madras Pres.
Scott, Edmund	Ceylon.
Scott, Capt. G. B.	Mooltan.
Scott, G. C.	Ceylon.
Scovell, C. E.	Thaton, Burma.
Scroggie, Capt. W. R. J. (I.M.S.)	Bombay.
Scroope, H. W. P. (I.C.S.)	Dumka, Sonthal Parganas, Bengal.
Seale, Dr. C. E. B.	Darjeeling.
Sealy, Capt. A. E.	Bakloh, Punjab.
Seervai, Dr. Rustom F.	Bombay.
Selous, Capt. R.	Quetta.

Service, Geo.	Bombay.
Seton-Karr, H. W. (Life Member)	*Europe.*
Settlement Reading Club, The Principal	Port Blair.
Sewell, J. H.	Rangoon, Burma.
Shakespear, Major J.	*Europe.*
Sharp, Professor W. H.	Bombay.
Shaw, Capt. W. S. J. (I.M.S.)	Rangoon.
Shepherd, W. C. (I.C.S.)	Bijapur.
Shepperson, C. I. W.	Coimbatore.
Shipp, W. E.	Ajmer.
Shevade, S. V. (B. SC.)	Pusa, Bengal.
Shortland, C. V. N. (A.M.I.C.E.)	Chakradharpur, Bengal.
Shoubridge, H. O. B. (C.E.)	Nasik.
Shuttleworth, Capt. A. R. B.	Simla
Silvester, C. J.	Sealdah, E. B. S. Ry.
Sim, E. L.	Bombay.
Simcox, A. H. A. (I.C.S.)	Jalgaon, Khandesh.
Simcox, Lt. C. T.	Sitapur.
Simonds, M. H.	Jacobabad, Sind.
Simpson, J. Hope (I.C.S.)	Allahabad.
Simson, Lt. R.	Allahabad.
Sinclair, R. L.	Kharaghoda.
Sind Club, The Hony. Secretary	Kurachi.
Singh, Bhai Sudhu, Forest Officer	Quetta.
Sitwell, Capt. N. S. H. (R.A.)	Calcutta.
Skilling, W.	Poona.
Skinner, J. M. (I.M.S.)	Nowgong, Bundelkhund.
Skinner, Capt. R. B. (R.E.)	Peshawar.
Skipwith, Capt. J. W. (R.E.)	*Europe.*
Sladen, Dr. R. J. L.	Bhusawal.
Slater, H. Kelshall	Bangalore.
Slater, J. Sanders	Bombay.
Smales, Chas. B. (I.F.S.)	Pyinmana, Upper Burma.
Smith, Major F. A. (I.M.S.)	Sehore, Bhopal.
Smith, Capt. H. H.	Allahabad.
Smith, J. W.	Sialkote.
Smith, Major O. A.	Mooltan.
Smith, S. D. (B.A.)	Bombay.
Smyth, S. W.	*Europe.*
Somerville, Lt.-Col. T. C. F.	Lebong, Bengal.
Somer-Smith, C.	Seoni, C. P.
Souter, C. A. (I.C.S.)	Ootacamund.
Southon, Capt. C. E. (I.M.S.)	Bombay.
Sowerby, M. H	Bombay.

Sparke, W.	Rangoon, Burma.
Sparling, A. H.	Rajghat, O. & R. Ry.
Spence, J. R.	Ahmedabad.
Spence, R. A.	Bombay.
Spooner, T. J. (C.E.) (Life Member)	Gadag, S. M. Ry.
Stables, Major Alex. (R.A.M.C.)	*Europe.*
Stack, Mrs. C. E.	Kasauli, Punjab.
Stallard, R. H. (R.E.)	Barrackpore.
Standen, B. (I.C.S., C.I.E.)	Pachmarhi, C. P.
Stanton, W. C.	Cawnpore.
Staples, E. W. H. (C.E.)	Dum Dum.
Stebbing, E. P. (I.F.S., F.L.S., F.E.S., F.Z.S.)	Dehra Dun.
Steel, Capt. D. (I.M.S.)	*Europe.*
Steen, Capt. R. (I.M.S.)	Mainpuri, U. P.
Steffen, O.	Bombay.
Stephens, L. B.	Karachi.
Stevens, Herbert	Lakhimpur, Assam.
Stewart, Capt. G. H. (I.M.S.)	Pegu.
Stewart, J. Lee	*Europe.*
Stewart, Capt. J. M.	Bombay.
Stewart, R. B. (I.C.S.)	*Europe.*
Stirling, J. H.	Jodhpur, Rajputana.
Stockley, Lt. J. P.	Kotra, Rajputana.
Stoney, R. F.	Tanjore, S. India.
Stonor, W.	Nagasamudram, S. M. Ry.
Storey, Thos. H.	Oodeypur.
Stockley, C. H.	Sheikh, Somaliland.
Storey, S. S.	Bombay.
Stringfellow, H. P.	Bombay.
Strong, F. W. (I.C.S.)	Dinajpur, E. Bengal.
Stuart, C. J.	Nellore.
Stuart, G. A. D. (I.C.S.)	Saidapet, Madras.
Stuart, J. D.	Mandalay.
Sulivan, Col. G. D. F.	*Europe.*
Summers, Thos. (C.E.)	Karachi.
Surveyor, Dr. N. F. (M.D.)	Bombay.
Swan, H. H.	*Europe.*
Swayne, Herbert (Life Member)	*Europe.*
Swinhoe, Genl. C.	*Europe.*
Swinhoe, R. C. J.	Mandalay.
Sykes, C. M. (C.E.)	Dhar, C. I.
Sykes, M. G. (I.C.S.)	*Europe.*
Symes, W. C.	Bombay.
Symington, J. H.	Bombay.
Symons, Lieut. H. (R.G.A.)	Kirkee.

Talbot, W. A. (I.F.S.)	Kirkee.
Tambe, Dr. Gopal Ramchandra, (M.A., B.Sc., L. M.& S.)	Indore, C. I.
Tanner, Major C. O. O.	Karachi.
Tata, Dorabji J. (Life Member)	Bombay.
Taylor, J. Stopford	Bombay.
Taylor, James H.	*Europe.*
Tejpal, Goverdhundas Goculdas (Life Member)	Bombay.
Tenison, Lt. W. P. C. (R.F.A.)	Nowshera, Punjab.
Tennant, G. F. D.	Bombay.
Thanewala, Y. D. (M.A.)	Bombay.
Thevenard, C. W.	*Europe.*
Thompson, Lt.-Col. Henry (I.M.S.)	Madras.
Thompson, R. H. E. (I.F.S.)	*Europe.*
Thompson, Capt. W. G. (R.H.A.)	Trimulgherry.
Thomson, St. C.	Kamarhattey, 24 Parganas.
Thomson, Major D. B.	Bombay.
Thomson, W. M. (I.M.S.)	Port Blair.
Thornhill, Col. H. B. (C.I.E.)	Simla.
Thornton, H. A. (I.C.S.)	Lashio, N. Shan States.
Thornton, Capt. F. E.	Bareilly.
Thorpe, Capt. L. L. G. (R.A.M.C.)	*Europe.*
Thring, Lt-Col. R. H. D.	Jubbulpore, C. P.
Thubron, J. B. S.	Nasik.
Tibbs, Rev. P. G.	Aden.
Tilly, T. H. (Life Member)	Limoru, British East Africa.
Tichborne, Sir Henry, Bart.	*Europe.*
Tinley, Col. G. F. N.	Meerut.
Tinne, P. (I.F.S.)	Kalimpong, Bengal.
Tipper, G. H.	Calcutta.
Tipping, P. G.	Sidapur, Coorg.
Tod, Alex. M.	Bombay.
Todd-Naylor, H. P. (I.C.S., C.I.E.)	Rangoon.
Tomkins, Capt. E. L. (R.A.)	Jubbulpore, C. P.
Tomkins, S.	Lahore.
Toppin, S. (R. A.)	Drosh, Chitral.
Tottenham, W. F. L. (I.F.S.)	*Europe.*
Townsend, Major E.	Rangoon.
Traill, W. H.	Bombay.
Travancore, H. H. The Maharaja Sir Sultan Rama Raja Bahadoor (G.C.S.I., G.C.I.E.) (Life Member).	Trivandrum.
Trench, C. G. C. (I.C.S.)	Damoh, C. P.
Trevor, C. G. (I.F.S.)	Kulu, Punjab.
Trevor, Surg.-Genl. F. W. (R.A.M.C.)	Calcutta.
Trivandrum, Hon. Sec., Government Museum and Public Gardens	Trivandrum.

Trotter, E. W.	Bangkok, Siam.
Troup, N. F. T.	Kousanie P. O., Almora.
Truninger, L.	Calcutta.
Turner, Capt. C. H.	*Europe.*
Turner, Sir Montague	*Europe.*
Tweedie, Lt. J. L.	Lahore.
Twiss, Lt. A. M. (R.E.)	Kirkee.
Tyabji, S. B.	Hubli.
Tyler, H. H. F. M. (I.C.S.)	Waltair, Vizagapatam Dist.
Tyrrell, Capt. J. R. (I.M.S.)	Sirdarpore, C. I.
Tytler, Maj. H. C.	Barrackpore.

Uehlinger, H.	Bombay.
Ulwar, H.H. Maharaja Sawai Jey Singh Bahadoor (Life Member)	Ulwar, Rajputana.
United Service Library, Hon. Secretary	Poona.
Unwalla, J. N. (Life Member)	Bhavnagar.

Vanrenen, Lieut. D. H.	Mussoorie, U. P.
Vaughan, W. (F.E.S.) (Life Member)	Ceylon.
Venning, F. E. W.	Haka, Chin Hills, Burma.
Venour, Major W. E. (I.A.) (Life Member)	*Europe.*
Vernede, Fred. E.	Munda Kayam, Travancore.
Vernon, C. V. (I.C.S.)	Hyderabad, Sind.
Vernon, H. A. B. (I.C.S.)	Madras.
Vincent, W. H. H. (I.C.S.)	Ranchi, Chota Nagpur.
Vipan, Alfred	Bezwada.
Vithuldas Damodhar Thakersey, The Hon'ble Sir	Bombay.

Wadeson, Col. F. W. G.	Jacobabad, Sind.
Wadia, D. N., Prof. of Biology at Jammoo	Kashmir.
Walker, Capt. G. K. (A.V.D.)	Lahore.
Walker, J. S. E.	Purnahia, Bengal.
Walker, Capt. W. B. (R.A.)	*Europe*
Wall, Major F. (I.M.S., C.M.Z.S.)	Almora, U. P.
Wallace, John (C.E.)	Bombay.
Wallace, R.	Sourabaya, Java.
Wallace, W. V. (I.C.S.)	Myingyan, Burma.
Wallinger, W. A. (I.F.S.)	*Europe.*
Wallis, R. W. D.	Mingin, Upper Chindwin, Burma.
Walsh, E. P. (I.C.S.)	Tindivanam S. Arcot.

Walton, Major H. J. (I.M.S., C.M.Z.S.)	Bombay.
Ward, Col. A. E.	Bareilly.
Ward, Major C. H.	Meerut.
Ware, Major F. C. Webb (C.I.E.)	Chagai, Quetta.
Warrender, H. E., Commodore Sir Geo.	Bombay.
Wasey, G. K.	*Europe.*
Waterfield, E. H. (I.C.S.)	Bandra, Thana Dist.
Watney, C. W.	Lucknow.
Watson, Capt. H. R.	Aden.
Watson, H. W. A. (I.F.S.)	Taunggyi, Burma.
Watson, Capt. J. W. (I.M.S.)	*Europe.*
Watson, Lt.-Col. W. A. (C.I.E.)	Agar, C. I.
Watson, W. M.	*Europe.*
Watts, Capt. G. A. R.	Lahore.
Watts, Lt. N. H. L.	Mandalay, Burma.
Webb, G. R.	*Europe.*
Webb, M. (I.C.S.)	Shikarpur, Sind.
Wein, J.	Bombay.
Weldon, W. L.	Bombay.
Wellborne, C. de M.	Poona
Wells, F. W. A.	Pokokku, U. Burma.
Wells-Cole, Major H.	*Europe.*
Wenden, H. (C.E., C.I.E.)	*Europe.*
Weston, A. T.	*Europe.*
Weston, W. V.	Surdah, Rajshahi, E. Bengal.
Whalley, P.	Rangpur.
Whately, Richard	Mount Abu, R.-M. Ry.
Whiffin, F. D.	Rourkela, B.-N. Ry.
Whitcombe, Major E. G. R. (I.M.S.)	Bombay.
White, Lt. A. W.	Kamptee, C. P.
White, Chas. W.	*Europe.*
White, W. P.	Beetal, C. P.
Whitehead, Lt. C. H. T.	Sehore, C. I.
Whitehead, John (I.F.S.)	Pilibheet, U. P.
Whittall, Brigade-Col. F. V.	Bombay.
Whitworth, G. C. (Life Member)	*Europe.*
Whymper, S. L.	Jeolikote, U. P.
Whyte, Lt.-Col. C. W.	Kamptee, C. P
Wickham, H. C.	Maymyo, Burma.
Wickham, P. F. (C.E.)	Port Blair.
Wigram, Major H.	Srinagar, Kashmir.
Wiles, G. (I.C.S.)	Godhra.
Williams, A. (I.C.S.	Quetta.
Williams, Capt. C. E. (I.M.S.)	Rangoon.
Williams, J. K.	Nasik.
Williams, Stanley Price	Bannu, N. W. F. P.

Williamson, K. B.	Jubulpore, C. P.
Williamson, W. J. F.	Bangkok, Siam.
Willis, R. A.	Bombay.
Willock, Lt. A. (R.I.M.)	Rangoon.
Wilson, Major Alban	Shillong, Assam.
Wilson, A. R.	Almora, U. P.
Wilson, A. T.	Muhammareh, Persian Gulf.
Wilson, Lt.-Col. C. H. L. F. (R.A.)	Allahabad, U. P.
Wilson, H. C.	Ootacamund.
Wilson, R. A. (I.C.S.)	Chanda, C. P.
Wilson, William Burns	*Europe.*
Winterscale, J. C. (F.Z.S., F.E.S.)	Penang.
Witham, Dr. E. Wells (M.D.)	Doom-Dooma, Assam.
Withinshaw, L.	Russellkonda.
Witt, D. O. (I.F.S.)	Khandwa.
Wood, Capt. A. E. (R.A.M.C.)	Sitapore, U. P.
Wood, C. W. (C.E.)	Vellore, Madras Presidency.
Wood, Capt. H. (R.E.)	Amraoti, Berar.
Wood, Major H. S. (I.M.S.)	Calcutta.
Wood, R. B. M.	Bhamo, Burma.
Woodhouse, E. J.	Bhagalpore.
Wooster, W. G.	Yawng Hwe, S. Shan States.
Wright, Major E. H. (I.M.S.)	Tanjore.
Wright, F. A. (C.E.)	Calcutta.
Wright, H. C.	Bombay.
Wright, R. R.	Calcutta.
Wright, W. D. (I.M.S.)	Cawnpore, U. P.
Wroughton, R. C. (F.Z.S.) (Life Member)	*Europe.*
Yeatman, Lieut. M. E.	Quetta.
Yeo, Edwin W.	Bombay.
Yerbury, Col. J. W. (R.A.) (Life Member)	*Europe.*
Young, E. H.	Ajmer.
Young, F. B.	*Europe.*
Young, Lt. M. J. D.	Madras.
Yule, Capt. R. A.	Chilas, Kashmir.

STATEMENT of ACCOUNTS (from 1st January 190 to 3 st D mber 90

RECEIPTS.	R .	a.	p.	s.	a.	p.
in Bank on 1st January 1907	4,798	1	8			
in hand on 1st January 1907...	46	0	0			
Pett cash balance in hand on 1st J nuary 1907	37	3	11	4,88	5	7
Subscriptions for 1902 (in arrears)..	15	0	0			
Do. do. 1903 (do.)..	15	0	0			
Do. do. 1904 (do.)..	50	0	0			
Do. do. 1905 (do.).	150	9	0			
Do. do. 1906 (do.).	547	10	0			
Do. do. 1907	3,304	7	1			
Do. do. 1908 (in advance)	982	12	0			
Do. do. 1909 (do.)	27	0	0			
Do. do. Life Membership.	200	0	0	5,272	6	
Entrance Fees				1,440	0	
Sale of back Journals, &c.				1,852	4	
Grant from the Government of bay for 907				5,000	0	
Sundries				629	6	
Interest on G rnment Paper				392	2	
Interest all by Bank ...				37	10	
Total s.				29,60	3	

(Sd.) L. H. SAVILE,
Hony. Treasurer.

BOMBAY, 1st *January* 1908.

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